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ABSTRACT

Adapted from Idaho's fourth grade agricultural education curriculum guide, this manual was created because there were insufficient resources available to Ohio students about the systems that provide human beings with food and fiber. Economically Ohio's largest industry, agriculture, serves as a basis for providing fourth-grade teachers with supplemental materials to use in the four curriculum areas typically taught in the fourth grade: language arts, science, mathematics, and social studies. The lesson plans are placed into the curriculum area by the major type of activity contained in that lesson. Each lesson is also assigned to some minor curriculum areas if they exist within the lesson plan. Five agricultural concepts are included: (1) history of Ohio agriculture; (2) production of food and fiber; (3) economics of Ohio agriculture; (4) conservation of natural resources; and (5) careers in agriculture. A matrix relates curriculum areas to the lesson plans that have major or minor relevance. There are five units in the guide: introduction; agribusiness; plants; animals; agriculture and natural resources; and information sources. The first four units include the following elements: (1) background (2) agriculture unit; (3) core, major; (4) core, minor; (5) related lesson plan; (6) remarks/notes; (7) resources; (8) premise; (9) objectives; (10) motivation; (11) vocabulary; (12) trivia; (13) suggested activities; (14) activity sheets; and (15) what has been learned. The information sources unit includes a 1990 directory of agriculture and an annotated list of 57 teaching materials available through Ohio sources. Copies of two color transparencies (soil ecosystem and soil profile) are included. (NLA)

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OHIO
Ag in the Classroom

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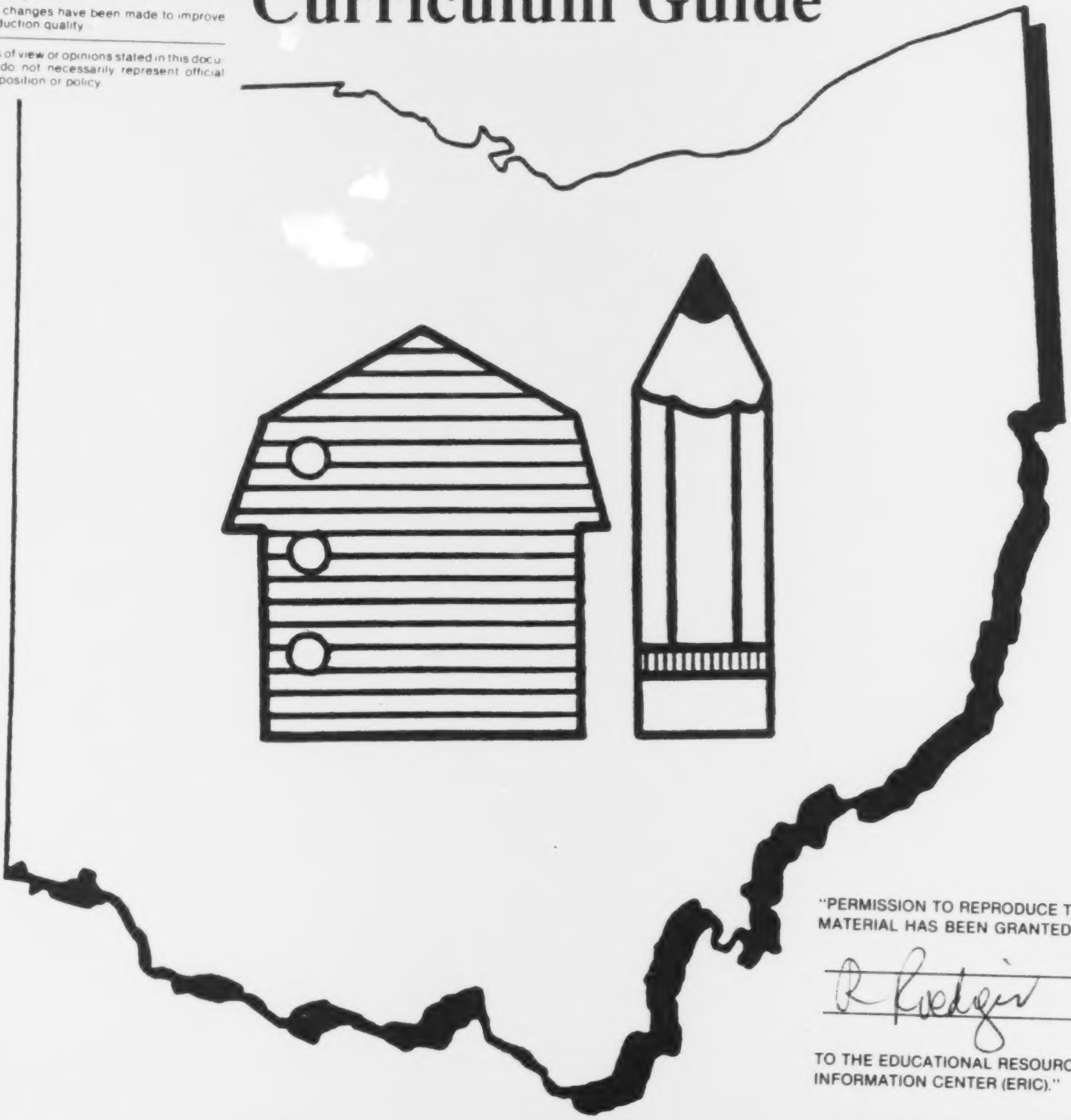
Fourth Grade Curriculum Guide



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As adapted from:

Idaho
Ag In The Classroom

Curriculum Guide
for
Fourth Grade Classes

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Provided through a grant from the
Idaho Ag In The Classroom Association

1988

Administered through the
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Richard F. Celeste, Governor
Steven D. Maurer, Director

To Friends of Education and Agriculture:

The notebook that you recently acquired is the culmination of years of contemplation, perseverance and innovation. The manual is a product long overdue, a product inspired by the vision of a small group of ladies called the "Women for Ohio Agriculture", the state affiliate of "American Agri-Women". These women came upon the sad realization that there were insufficient resources available to teachers who desired to teach their students about the systems which provide our food and fiber. The Ohio Agriculture Awareness Council was created as a result of the growing interest of educators, farmers, and representatives from other agricultural organizations. The council oversees the newly formed Ag in the Classroom program.

Not too long ago some lessons were devised in Idaho that seem a perfect match for the needs of our own state. We were granted permission to adapt Idaho's guidelines with the hopes that they will aid today's students in increasing their understanding and appreciation for the food and fiber systems. It is our wish that our children will mature into responsible, well-informed, and conscientious members of the active and voting general public.

We at the Ohio Department of Agriculture are extremely proud and enthusiastic to be a part of this worthy project. Ohio enjoys a plethora of wonderful and varied resources which enable our state to rank among the nation's leaders in terms of agricultural output. However, our number one resource is undoubtedly our people.

I dearly hope that this notebook will be an asset in teaching our young children of the importance and intricacies of agriculture, a somewhat forgotten and overlooked field in the eyes of children today.

Sincerely,

Steven Maurer

Steven D. Maurer
Director

STATE OF OHIO
DEPARTMENT OF EDUCATION
COLUMBUS

FRANKLIN B. WALTER
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PUBLIC INSTRUCTION

DARRELL L. PARKS, DIRECTOR
VOCATIONAL AND CAREER EDUCATION
907 OHIO DEPARTMENTS BUILDING
65 South Front Street
Columbus, Ohio 43266-0308

Dear Educator:

Congratulations on your interest in teaching about the source of our food and fiber. As the Director of the Agricultural Education Service, I am extremely pleased to introduce you to this set of lessons about agriculture.

Just a few words about what these materials are and what they are not. First, they are not intended to serve as a vocational or technical program to teach young people how to be farmers. They are also not intended to be a public relations tool to extol the virtues of Ohio agriculture. Instead, using Ohio's largest industry as the basis for learning, these materials have been developed to provide teachers with supplemental materials to use in science, math, social studies, geography and economics curricula areas.

Many people have been instrumental in the efforts of putting together this material. We are deeply grateful to Dr. Doug Pals for sharing Idaho's work. The Ohio Agriculture Awareness Council deserves special recognition for realizing the need for educational resources, giving leadership to Ohio's Ag in the Classroom program, and sponsoring this project. The Ohio Agriculture Awareness Council is a coalition of sixteen agricultural and educational organizations working together to help improve agricultural literacy.

The Agricultural Education Curriculum Materials Service, at The Ohio State University, is to be commended for an excellent job of blending the Ohio information into the Idaho format.

It is our hope, that your students will enjoy the activities, learn from the information, and acquire a greater understanding of the importance of agriculture.

Best wishes to you, the educator - your job is so important to **all** of us. Please share the materials with fellow teachers.

Sincerely,

John H. Davis
Director

AGRICULTURAL EDUCATION SERVICE

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Acknowledgments

The format used in this guide was developed from ideas generated by using material shared from many states. An attempt was made to give credit to those sources throughout the guide. Realizing that many of the sources used also cited materials from other sources, it is our hope that we did not miss anyone or give the wrong source.

Many individuals have made substantial contributions to the development and publication of this guide. While all of them cannot be recognized, we do extend our sincere thanks for their contributions and efforts. The following people were especially influential in the development of this guide.

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Curriculum Guide Reviewers

Many individuals have reviewed the subject matter for accuracy. These people represented agricultural organizations, commodity commissions and the faculty of the University of Idaho College of Agriculture. Their suggestions and additions ensured the accuracy of the technical information in this curriculum guide.

Thanks to the following individuals for contributing to the Ohio adaptation of the Guide:

Sponsored by the **Ohio Agriculture Awareness Council Board of Directors:**

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Ohio Editor - Judy Roush

Special appreciation to –

Ohio Farmer Magazine - for use of the agricultural directory appearing in the Resource section
Soil Conservation Service - for graphics identified by the logo appearing throughout the notebook
Staff of the Ohio Agricultural Education Curriculum Materials Service - for support and guidance

What Is Ohio Ag in the Classroom?

Your life and the lives of your students depend on Ohio agriculture - in more ways than one. Not only does Ohio agriculture provide you with a regular supply of healthy food, clothes to wear and houses to live in, it also provides a good share of your salary and the salary of your friends and neighbors. Ohio agriculture generates about $4 billion every year making agriculture Ohio's No. 1 industry. For each farm worker there are more than 13 Ohioans employed in other industries linked to agriculture.

A lack of awareness about agriculture is creating critical problems that could jeopardize Ohio's economic future. With less than 2 percent of the population involved in production agriculture, the general public is far removed from the source of their sustenance. Yet, they can impact it with decisions made in the voting booth with no basic understanding of agriculture. There is also concern about the projected shortage of trained agricultural professionals as enrollment in agriculture schools drops. The image of agriculture as a high-technology business needs to be brought into the classroom to interest tomorrow's leaders and scientists.

The **Ohio Agriculture Awareness Council** was formed in 1986. The council is responsible for the Ag in the Classroom Program in Ohio. Developing student awareness, appreciation and understanding of how the food and fiber production system affects our economy and society is a long term goal of this group. The **Ohio Agriculture Awareness Council** is dedicated to coordinate and sponsor methods of promoting the awareness of agriculture in Ohio.

Adapting this easy-to-use curriculum guide has been a major project for the council. This guide will infuse agricultural related information into existing courses currently taught in Ohio's fourth grade classroom.

The goal of the **Ohio Agriculture Awareness Council** is to help students increase their knowledge of the role that agriculture plays – in Ohio, the United States and the world – thus enabling youth to make intelligent decisions as consumers, voters and eventually public leaders. Not all students need to be employed in agriculture, but an understanding of how it affects their lives will allow them to make better personal and public decisions that affect the industry. It is also likely that a good percentage of them will be employed in some phase of agriculture.

Ohio Ag in the Classroom

Needs Statement

Ohio elementary students' knowledge of agriculture is limited. The degree to which our state depends upon agriculture and the depth and breadth of the industry is typically not included in traditional text books.

Philosophy

It is the intention of this project to promote educational activities around the following concepts:

1. Teach respect for the land.
2. Learn the food chain and the cycle of life.
3. Understand steps in the process of food production.
4. Realize that crops have different life cycles.
5. Discover that we are of the global community.
6. See that the value of land is directly proportional to our quality of life.

The importance of agriculture to the health and economy of the state of Ohio predicates that educating the students in the direct and indirect relationships between them is beneficial. This curriculum aspires to impact the students' affective and cognitive domains. The agricultural concepts, principles and facts contained herein will prepare students for the ever changing world in which they live.

Rationale

The lesson plans selected to be included in the *Ohio Ag in the Classroom Fourth Grade Curriculum Guide* play an integral part in humankind's ability to provide food, fiber and shelter for itself. The **Ohio Agriculture Awareness Council** hopes these lessons will influence the quality of life in Ohio and provide a basis for planning for Ohio's future. As the agricultural industry changes in Ohio, we must be conscious of the new demands imposed upon the state's resources. This curriculum guide will invest Ohio's elementary students with the basis for understanding that responsibility.

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Use of This Publication

The *Ohio Ag in the Classroom Fourth Grade Curriculum Guide* has 34 individual lesson plans. The lesson plans are arranged under the four curriculum areas typically taught in the fourth grade: language arts, science, social studies, and mathematics. The lesson plans are placed into the curriculum area by the major type of activity contained in that lesson. Each lesson is also assigned some minor curriculum areas if they exist within the lesson plan.

Five agricultural concepts are included in the curriculum guide. The agricultural unit is identified at the top right corner of each lesson plan. The five agricultural concepts included are:

1. History of Ohio Agriculture
2. Production of Food and Fiber
3. Economics of Ohio Agriculture
4. Conservation of Natural Resources
5. Careers in Agriculture

A matrix is provided with the Table of Contents to enable the teacher to quickly find those lessons which have activities in the designated topics.

Also included in the curriculum guide is a section with other resources available for further activities related to agricultural topics.

Lesson Plan Design

1. **Background** – Information about the lesson plan subject matter designed to give the teacher and/or student necessary material in order to understand the lesson and complete the activities. These are designed to be used either by the teacher or duplicated and handed out to the students as a reading assignment.
2. **Ag Unit** – Defines which of the five agricultural concepts are covered in this lesson plan.
3. **Core, Major** – This is the major curriculum area the lesson plan would best fit. This is usually related to the material covered in the lesson and the type of activities included.
4. **Core, Minor** – Many lesson plans contain more than one activity related to a curriculum area. The minor curriculum areas are listed here.
5. **Related Lesson Plan** – A portion of the lesson plan may relate to another plan and could be incorporated into that lesson. This space is provided to you for this cross referencing.
6. **Remarks/Notes** – This space is provided to the teacher to write comments to aid in the teaching of the lesson.
7. **Resources** – These are all the materials required to successfully teach the lesson plan. This is located at the beginning of the lesson plan so the teacher can plan ahead and prepare to collect items in advance for the lesson plan.
8. **Premise** – This is an introductory statement written on which the lesson plan is based.
9. **Objectives** – These are the desired behavior goals expected of the student at the end of the lesson.
10. **Motivation** – These are included to remind the teacher to assess the students' knowledge of the topic at hand and to serve as a method of gaining the interest of the class members.
11. **Vocabulary** – Each unit has a list of words that students are required to know in order to gain the maximum benefit from the lesson.
12. **Trivia** – This section includes a few interesting tidbits which can be used by the teacher to stimulate interest in the topic.
13. **Suggested Activities** – Several activities are suggested that will enhance the lesson plan. The teacher can select from those activities that would best fit specific locations in Ohio, the characteristics of the students in the class and the resources available in the school and community.
14. **Activity Sheets** – Some of the suggested activities have worksheets included in the guide. These are provided for the teacher to duplicate and hand out to the students.
15. **What Have You Learned?** – Each unit ends with a posttest designed to be used by the teacher in assessing if the objectives of the lesson have been accomplished. Posttest answers are on the last page of the unit. The teacher may duplicate the posttest to hand out to the students. "What Have You Learned?" can be used as a pretest or could be used to assist the teacher in leading an oral discussion.

Care of the Materials

The cost of reproduction of this guide prohibits the replacement of these materials. Therefore, please be extremely careful in handling originals. Make the necessary copies of the information you wish to hand out to students and return originals to the curriculum guide notebook. Take extra care in keeping originals clean for future reproduction.

CONTENTS

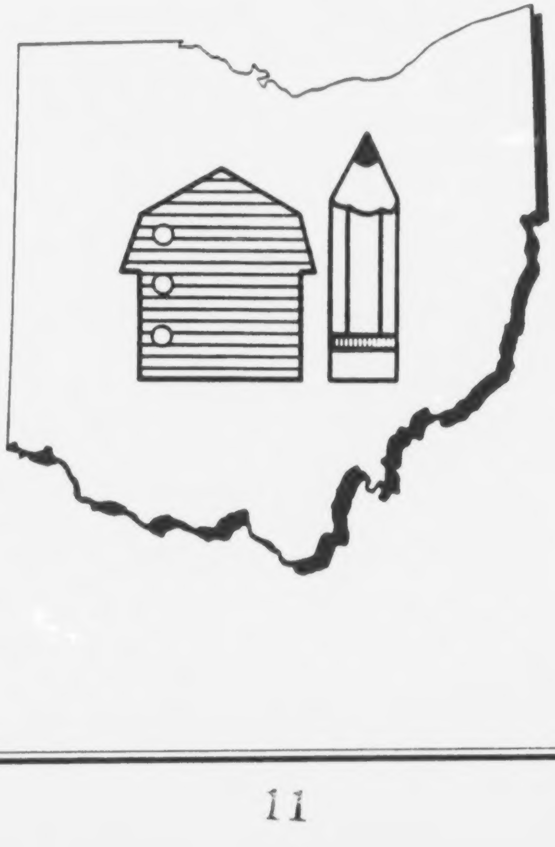
MATRIX

■ = Major
❑ = Minor

Language Arts	Social Studies	Economics	Science	Mathematics	Health/Nutrition	Unit Title
						Introduction
■	❑					1. Symbols of Ohio (4 pages)
■	❑			❑		2. Grandpa Brown's Trunk (6 pages)
■	❑					3. Trunks and Tall Tales (4 pages)
						Agribusiness
❑	❑	■		❑		4. Ohio's Largest Industry (16 pages)
		■		❑		5. Farm Value (11 pages)
	■	❑				6. Cooperatives (13 pages)
❑	❑	❑		■		7. Ohio's Exports (20 pages)
❑			❑		■	8. Nutrition (16 pages)
	❑				■	9. Sanitation, Labeling, and Handling of Food (8 pages)
❑	■	❑		❑		10. Agriculture and Media (8 pages)
❑	■					11. Careers in Agriculture (20 pages)
						Plants
❑			■			12. The Start of Life - the Life Cycle (12 pages)
❑	❑		■			13. Biotechnology in Agriculture (12 pages)
❑			■		❑	14. Micronutrients (12 pages)
			■	❑	❑	15. Plant Growth (14 pages)
❑	❑		■			16. Crop Production Steps (8 pages)
❑		❑	■	❑		17. Corn (8 pages)
		❑	■	❑	❑	18. Soybeans and Other Legumes (10 pages)
❑	❑				■	19. Small Grains (10 pages)
❑	❑	❑		■		20. Fruit Crops (10 pages)
	❑	❑	■	❑		21. Tree Farming (8 pages)
						Animals
■		❑		❑	❑	22. Beef Cattle (12 pages)
❑	■	❑		❑	❑	23. Dairy Cattle (11 pages)
❑	■	❑		❑		24. Sheep Production (12 pages)
■	❑					25. Horses (9 pages)
	■	❑		❑		26. Swine Production (10 pages)
			■	❑		27. Poultry Production (10 pages)
						Agriculture and Natural Resources
❑	❑	❑	■			28. What Are Natural Resources? (9 pages)
			■		❑	29. Air (6 pages)
❑			■	❑		30. Water Conservation (8 pages)
❑	❑		■			31. Weather and Agriculture (11 pages)
			■			32. Soils (7 pages)
❑	❑		■			33. Soil Conservation (16 pages)
	■			❑		34. Land Use Planning (12 pages)
						Information Sources (19 pages)

Introduction

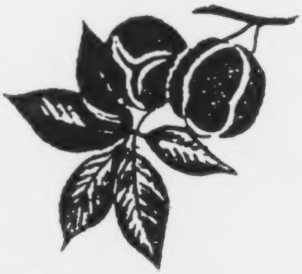
Unit	Title
1.	Symbols of Ohio
2.	Grandpa Brown's Trunk
3.	Trunks and Tall Tales

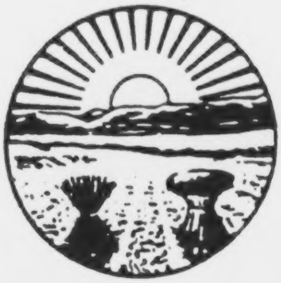


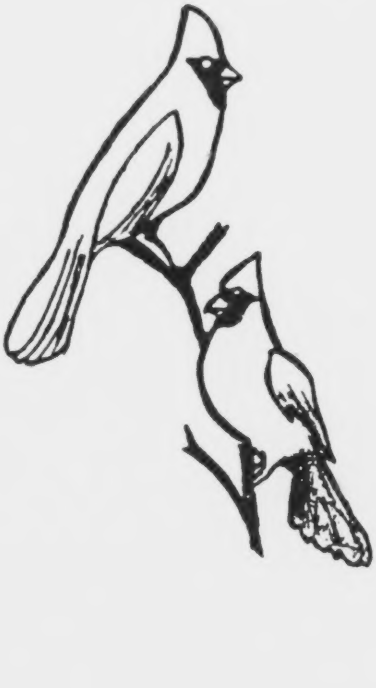
Symbols of Ohio

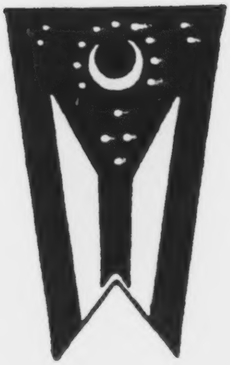
Background — State Symbols

		Adopted
State flag	Pennant-shaped	1902
State flower	Scarlet carnation	1904
State Bird	Cardinal	1933
State tree	Buckeye	1953
State gemstone	Ohio flint	1965
State seal	Landscape and sun	1967
State insect	Ladybug	1975
State animal	White-tailed deer	1988









Lesson: Symbols of Ohio

Resources:

Ohio history book, symbols of the state, and the booklet - *Ohio Citizen's Digest* available from:

Secretary of State
30 E. Broad St., 14th floor
Columbus, OH 43215

Premise:

The symbols of Ohio were chosen for specific purposes. The purpose of the lesson is to find those reasons.

Objective:

The students will develop library skills, research a subject and write a one-page report.

Trivia:

1. Ohio's "Great Seal" was inspired by a view of the sun rising over Mt. Logan. While visiting at Adena, a county estate of Thomas Worthington, the designer of our seal, William Creighton, noticed how the sun cast a rosy light on surrounding wheat fields. The seventeen arrows represent Ohio being the 17th state.

2. Washington County was the first of Ohio's 88 counties to be organized. It was named for (of course) George Washington, who was President of the Continental Convention (1788).

3. Tomato juice became the official state beverage in 1965. Ohio leads the country in the production of tomato juice.

4. Ohio's nickname is the "Buckeye State."

Ag Unit: **Natural Resources**
Core
Major: **Language Arts**
Minor: **History/Social Studies**

Related Lesson Plans

Ohio's Largest Industry

Remarks/Notes

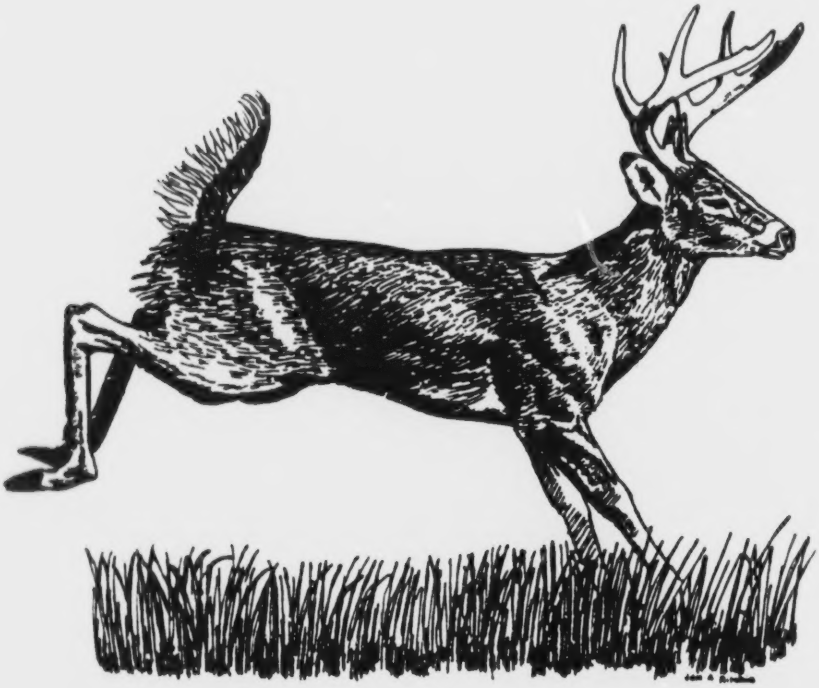
Suggested Activities:

1. Using the State Symbols, have the students select one of these symbols, research it, and write a one-page report. Special attention should be paid as to why this symbol was chosen for Ohio. (There are other official state symbols, not shown.)

2. Make a bulletin board of all the symbols with a short note as to the importance of the symbol.

3. Have students draw and color separate symbols on the state seal and combine into one seal.
   a. Students could also use colored felt.
   b. Implementaion: project picture on opaque surface and trace onto desired size of butcher paper.

4. Reproduce the map of Ohio (Unit 4, page 9) for students and have them locate significiant symbol-setting spots in the state.



Introduction
Unit 2

Grandpa Brown's Trunk

Background – Grandpa Brown's Trunk

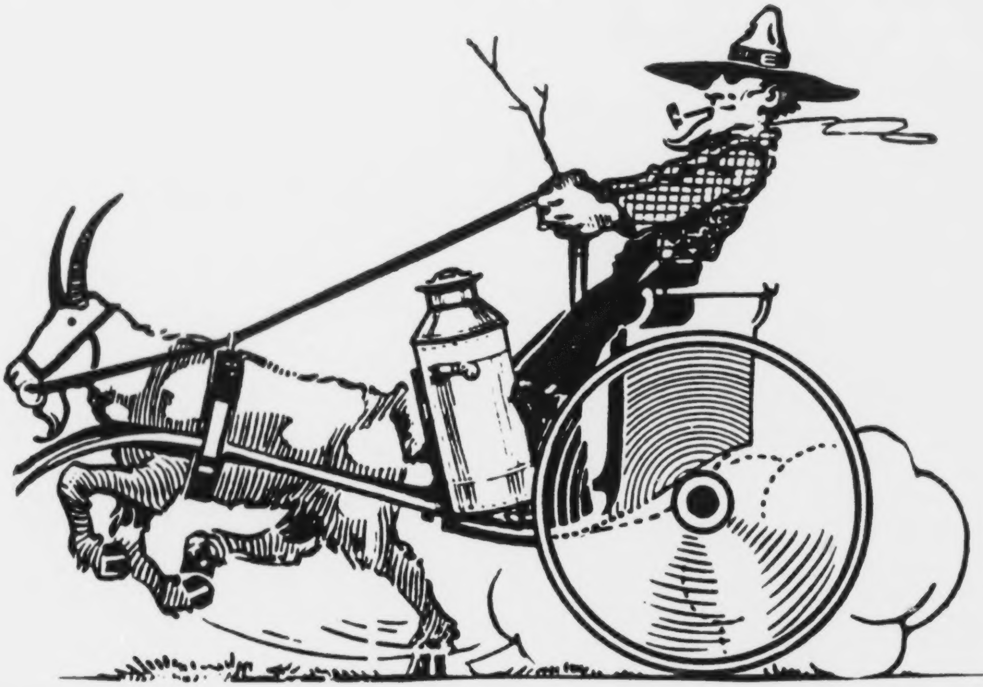
Grandpa Brown's will and testament states that his estate of $250,000 will be divided among his many grandchildren! There is one catch, however! Before any grandchild can receive any money, he/she must prove his/her worth to Grandpa Brown.

Grandpa Brown wanted to make sure his money would be used creatively. The will states that each grandchild must go through Grandpa's old trunk and find some "new" use for each object in it. Nothing can be sold; each item must be used in a fresh, new way. Try to discover some really different uses for these items:

Sample Key to Objects

(see pages 5 and 6)

1. Saw buck – bucking bronco
2. Steam tractor – toy fire truck
3. Pump – stand for mailbox
4. Wire – berry trellis
5. Hayslip – sled
6. Hay fork – potato digger
7. Outhouse – tool shed or gang's club house
8. Hay loft – slumber party, swing on rope
9. Sad iron – door stop
10. Milk can – umbrella holder
11. Plow – garden decoration
12. Grindstone for sharpening tools – imaginary bicycle
13. Washboard – tin pan board
14. Churn – potato masher
15. Pitcher pump – muscle builder
16. Grain scoop – dust pan
17. Horse collar – mirror or picture frame
18. Coal bucket – flower pot
19. Double tree (used with two horses to hitch wagon) – hang flower pots on or as a coat hanger)
20. Flour – flour paste or use sacks for tea towels
21. Milk stool – patio decoration
22. Coal shovel or clinker shovel – kid's sandbox toy
23. Lard pail – lunch bucket or paint bucket
24. Kerosene lantern – use when electricity is out



Lesson: **Grandpa Brown's Trunk**

Resources:

Intro sheets for "Grandpa Brown's Trunk."

Premise:

This lesson will provide the student with a creative thinking lesson. Creative thinking is important for problem-solving activities.

Objectives:

Students will be able to create new uses for old tools using an object from "Grandpa Brown's Trunk."

Suggested Activities:

1. Rules for creative thinking.
   a. Ditto or copy the sheets entitled "Objects in Grandpa Brown's Trunk" and distribute a set to each student. Or divide into groups and each group be responsible for a predetermined number of pictures to be completed.
   b. Read the instruction section to the students making sure everyone understands the purpose of the game.
   c. Payment from the estate can be made in one of several ways:
      1. First to find a new use with all completed takes all the money (not very fair to most).
      2. Money is equally divided among finishers (most recommended).
      3. Let the students decide on payments to be made.
   d. Write out the checks to the students (page 4). If the students don't know what each item is, tell them.
2. Pick any three pictures and write a story using these items.

Adapted with permission from "Creative Ways To Cultivate Agriculture in the Classroom," North Dakota.

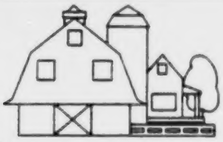
Ag Unit: **History of Ohio Ag Core**
Major: **Language Arts**
Minor: **History/Social Studies**

Related Lesson Plans

Trunks and Tall Tales

Remarks/Notes

1st Prize — $150,000



______ 19__

Pay to the order of ______ $ ☐

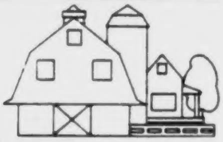
______ Dollars

First Farmers Bank
1537 Buckeye Lane
Somewhere, Ohio 43001

For ______ ______

⑆123

2nd Prize — $100,000



______ 19__

Pay to the order of ______ $ ☐

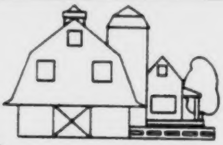
______ Dollars

First Farmers Bank
1537 Buckeye Lane
Somewhere, Ohio 43001

For ______ ______

⑆123

3rd Prize — $50,000



______ 19__

Pay to the order of ______ $ ☐

______ Dollars

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1537 Buckeye Lane
Somewhere, Ohio 43001

For ______ ______

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Objects in Grandpa Brown's Trunk

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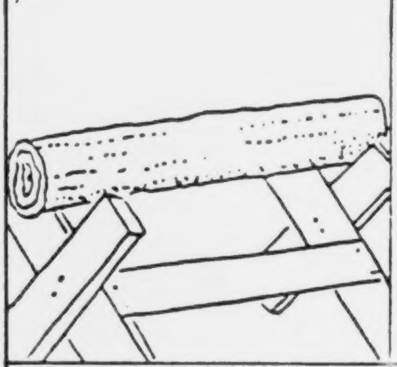

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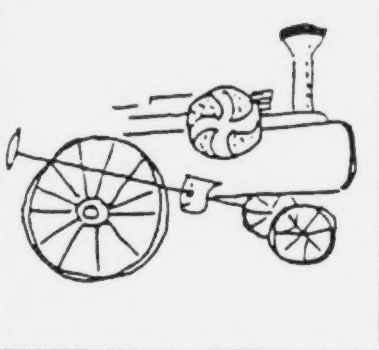

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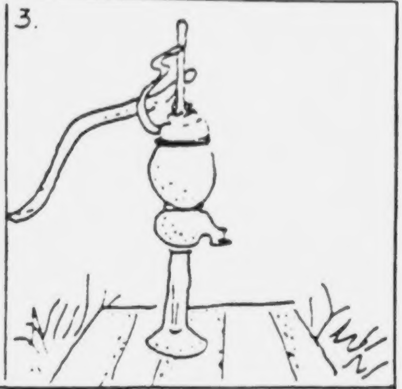

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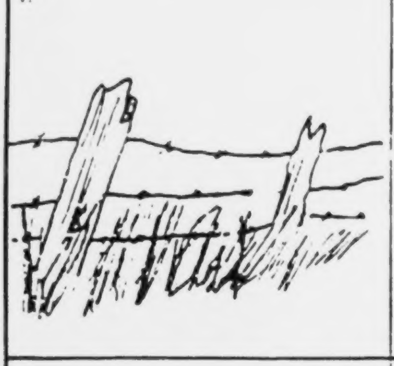

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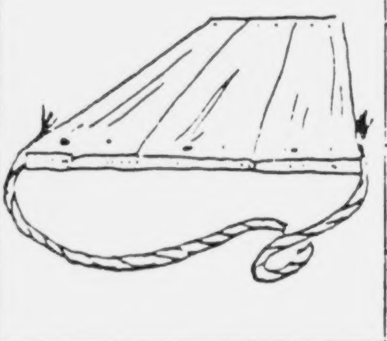

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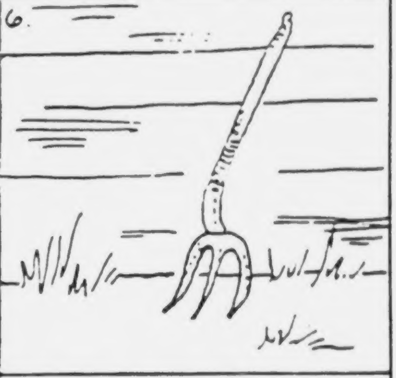

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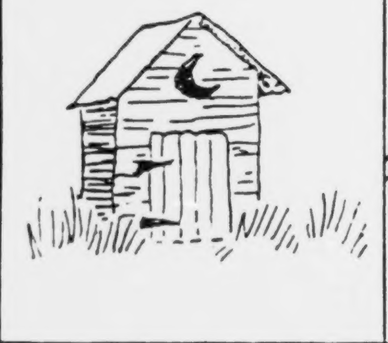

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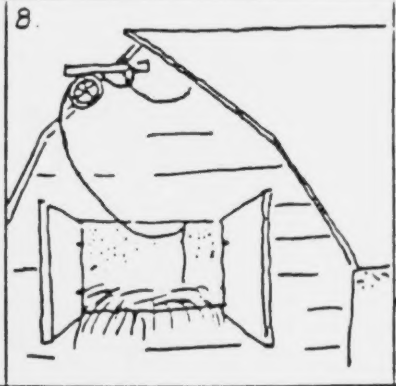

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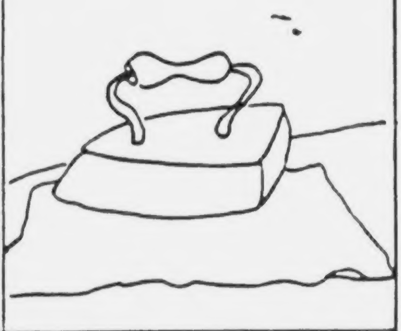

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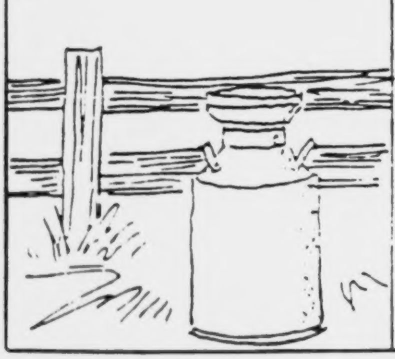

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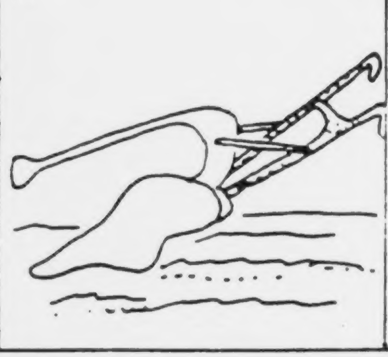

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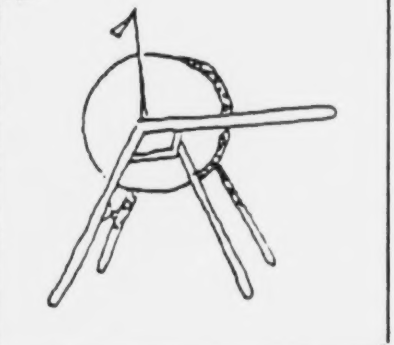

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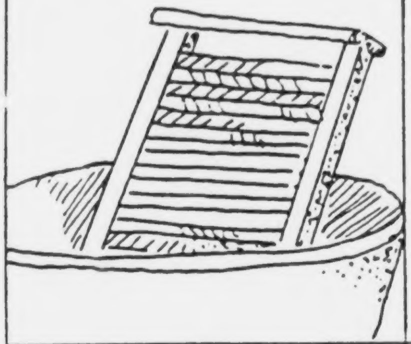

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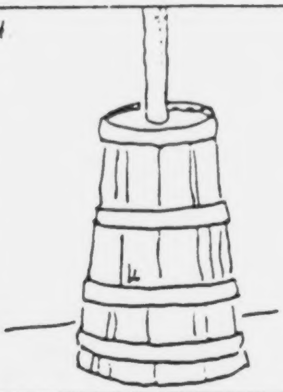

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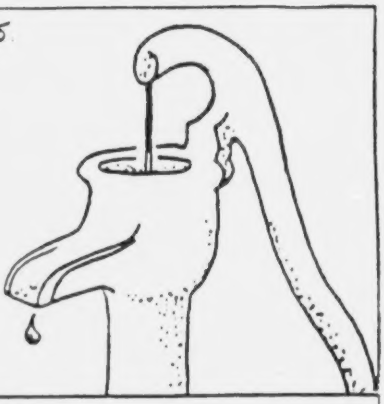

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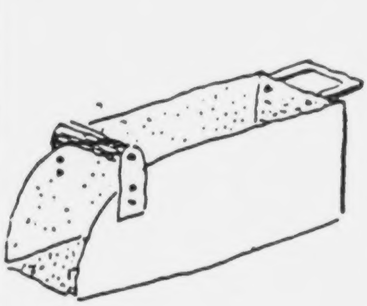

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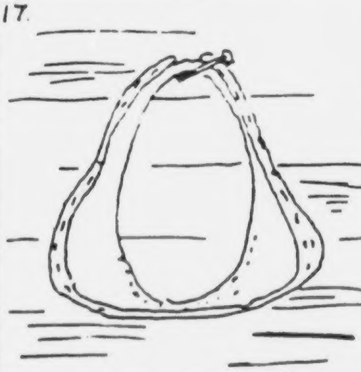

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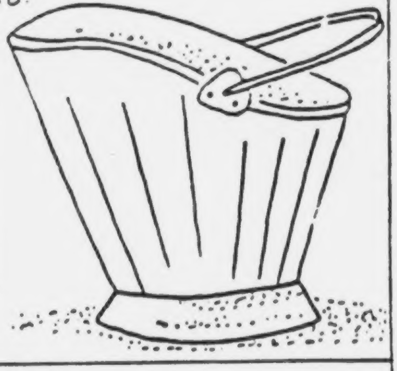

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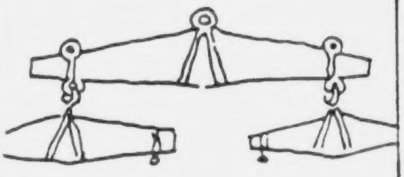

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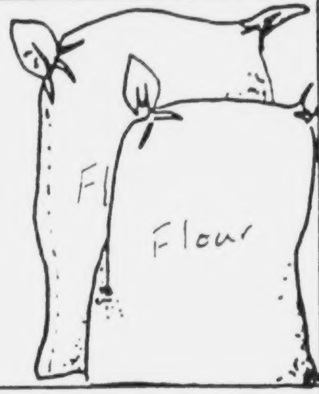

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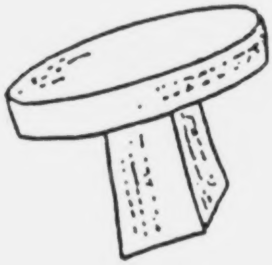

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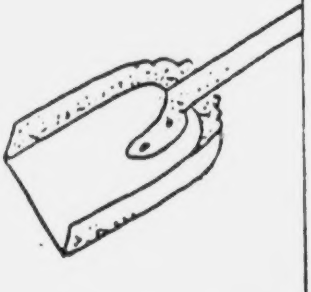

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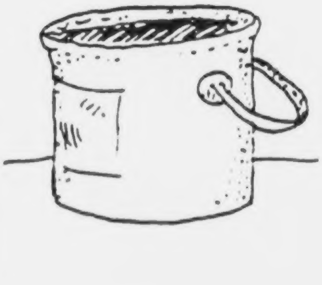

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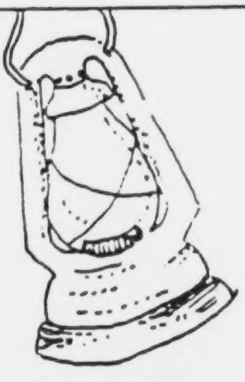


(Key found on Page 2.)

Trunks and Tall Tales

Lesson: **Trunks and Tall Tales**

Resources:

Paper, pencils, trunk tales sheet, creative writing story starters.

Premise:

Creative thinking is an important part to creative writing and agriculture. Many agricultural advances came from creative thinkers.

Objectives:

1. Be able to write or tell a story from the titles or descriptions in Grandpa Brown's Trunk (page 2) or Story Starters and titles.

Suggested Activities:

1. Have the students pick one of the Trunk Tales (page 3) or Story Titles (page 4) and have them create an oral tale about the topic.
2. Have the students write their stories on paper. Let them be creative and reinforce the creative process.
3. Let the students read and answer if any of the stories could be true or just a story.

Adapted with permission from "Creative Ways To Cultivate Agriculture in the Classroom," North Dakota.

Ag Unit: **History of Ohio Ag**
Core
Major: **Language Arts**
Minor: **Social Studies**

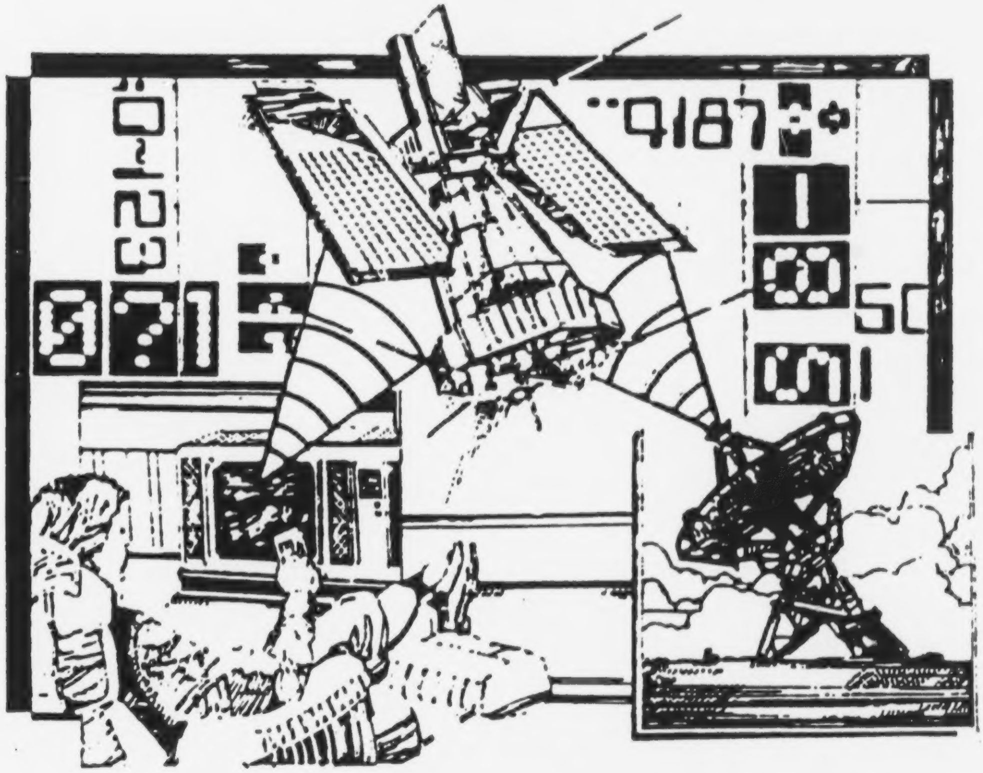
Related Lesson Plans

Grandpa Brown's Trunk

Remarks/Notes

Trunk Tales (Creative writing)

1. Upon visiting a farm you are lucky enough to find an old trunk in the farmhouse attic. Open it up and tell about the interesting memories tucked away just waiting for someone to discover or the history of each item found in the trunk.
2. What if this old trunk could talk? Think of the fascinating tale it could tell. When our early Ohio homesteaders came West to prove up on a claim, they always brought a trunk with them. Write of that long journey to our state.
3. When a homesteader prepared for a move to Ohio, decisions had to be made. What needed to be packed in the trunk? Describe some items that you would have put in your trunk for your new home in Ohio.
4. You have just bid on and purchased an antique trunk. Now take it home and fill it with 10 of your favorite possessions. Tell us what they are and why you chose to put them into the trunk.
5. What if you found a time capsule that was dated the year 3000? What items would the farms of the future need? Make a picture dictionary of these miracles of the agricultural future.
6. Make an analogy between a trunk full of treasures and the natural farm resources of Ohio. How are these resources a never-ending treasure to our state?
7. Some treasures can't be touched or held in your hand; they are sights and sounds of the farm, like the sound of a rooster's crow or a burst of sunlight over the fields. If you could capture some of these sights and sounds, which ones would you put in your trunk?
8. You have been asked to select the most important item in agriculture to be put in a time capsule. You can select only one item. Tell what it would be. Defend your reasons for selecting it.



Adapted with permission from "Creative Ways To Cultivate Agriculture in the Classroom," North Dakota.

Creative Writing Story Titles

The Cow Who Lost Her Moo
The Pony That Ran Away
The Pig That Could Roller Skate
The Horse That Could Fly
How To Brush a Horse's Teeth
The Cow That Gave Strawberry Milk
If I Could Ride a Bull
The Cotton Candy Machine That Over-Flowed and Wouldn't Stop
The Bull That Could Only Walk Backwards
The Day All the Animals on the Farm Could Talk
The Pig That Went on a Diet
The Shaggy Sheep's Problem
The Goat with Green Spots
The Pig That Won First Prize
The Five-Eyed Beast
The Three-Headed Horse
The Dinosaur Pulling Contest
How To Groom a 2,000-Pound Steer
The Sheep Who Ate the Judge's Hat
The Pig That Wouldn't Stop Growing
The Sheep That Couldn't Sleep
The Flying Bus
The Bunny That Ate His Green Ribbon
The Horse That Out-Pulled the Tractor

Reprinted with permission from "Agriculture in Montana Schools."

Agribusiness

Unit	Title
4.	Ohio's Largest Industry
5.	Farm Value
6.	Cooperatives
7.	Ohio's Exports
8.	Nutrition
9.	Sanitation, Labeling, and Handling of Food
10.	Agriculture and Media
11.	Careers in Agriculture

Agribusiness
Unit 4

Ohio's Largest Industry

Teacher Background
Ohio's Largest Industry

Nationwide, only 2 percent of all people are involved in production agriculture. **Production agriculture** is the actual raising of a crop or livestock. When our country was founded, three in four people were involved in production agriculture, but through some agricultural revolutions, machinery replaced the number of people needed on the farm. Now, only two people in 100 are farmers; however, 25 of those 100 are involved in marketing, processing, distribution and retailing of food and farm products.

Although Ohio ranks in the top 10 for several crops and livestock products, it's the real **value added** by related industries that process these agricultural products which add up to many billions of dollars annually. Ohio agriculture is more than 10 times larger than its farming sector when measured in terms of value of products produced and marketed.

OHIO YIELD AND PRODUCTION, 1988

Commodity	Unit	U.S. Rank	Yield per Acre	Production
				thousands
Field Crops				
Corn for grain	bu	6	85.0	255,000
Corn for silage	T	10	10.5	2,625
Oats	bu	8	45.0	9,000
Soybeans	bu	6	27.0	99,900
Sugar beets	T	12	16.1	237
Tobacco	lb	9	1,850	14,497
Wheat, winter	bu	12	50.0	46,000
Vegetables, Fresh				
Celery	cwt	6	400	140
Lettuce	cwt	10	120	168
Onions, storage	cwt	9	300	165
Sweet corn	cwt	7	55	578
Tomatoes	cwt	15	125	275
All fresh veg.	cwt	13		1,571
Vegetables, Processing				
Cucumbers	T	7	9.3	36.27
Tomatoes	T	2	20.3	359.31
Fruit				
Apples	lb	12		95,000
Grapes	T	7		8.9
Strawberries	cwt	7	56	73

OHIO PRODUCTION AND INVENTORY, 1988

Commodity	Unit	U.S. Rank	Production or Inventory
			thousands
Poultry and Poultry Products			
Chickens - inv., 12/88	head	5	23,000
Egg prod., 12/87-11/88	mil	4	4,477
Livestock			
Hogs and pigs (12/01/88)	head	8	2,210
Sheep and lambs (1/01/89)	head	15	246
Milk and Milk Products			
Milk production	mil lb	8	4,835
Swiss cheese	lb	1	59,814
Lowfat cottage cheese	lb	3	16,147

Source: *Ohio Agriculture - A Profile by the Ohio Agricultural Statistics Service* - brochure, Dec., 1988

Student Background – Ohio's Largest Industry

What Is Agriculture?

Agriculture is the business of producing, processing, distributing, and retailing food and fiber. Agriculture is also all of the businesses that provide supplies and services to the food and fiber system. Across Ohio you can find agriculture: growing crops, raising livestock, processing food, sawing lumber and arranging flowers.

Growing plants, raising animals, raising fish and logging are production operations. In other words, production is that part of agriculture that produces raw material. Add all of these together and you learn that agriculture is a very big business in Ohio. For instance, Ohio produces a large amount of the nation's corn and soybeans and ranks second in the nation in production of processed tomatoes.

Processing is taking a raw material and making a finished product out of it. The finished product may take many forms. For example, wheat can be made into flour and then into a cake mix, bread or spaghetti.

Distribution means carrying a product from one place to another. Trucks, planes, ships, or rail cars can be used. Usually, products are first taken to a wholesale center and then transported to retail outlets.

Retailing is shoppers buying products. This may be at a grocery store, department store, lumberyard, florist, cafeteria or a nursery.

Major Steps a Raw Product Goes Through

Step	People
1. Harvesting (taken from the plant or ground)	Farmer, hired hand
2. Hauling to the processing plant	Truck driver, product-receiver at the plant
3. Washing	Equipment operator
4. Preparation	Inspectors, equipment operators
5. Freezing, dehydrating, cooking	Equipment operator
6. Packaging	Packager operator
7. Hauling to warehouse	Trucker, loading dock personnel
8. Wholesaler	Salesperson, buyer
9. Retailing	Grocer, teller, box person, stock person

How much food do you eat in a year?

An average American eats the following amounts of food:

1. 144 pounds of beef, veal, pork, and lamb
2. 69 pounds of chicken and turkey
3. 306 pounds of dairy products
4. 193 pounds of vegetables
5. 138 pounds of fruit and juices
6. 33 pounds of eggs
7. 86 pounds of potatoes (including sweet)

From every dollar you spent on farm products, the farmer received:

1. Carrots	37¢
2. Hamburger	57¢
3. Milk	56¢
4. Potatoes	27¢
5. Poultry	51¢
6. Bread	7¢

The farmer receives more for unprocessed foods than for processed foods. He or she gets more for hamburger than for bread.

Lesson: **Ohio's Largest Industry**

Resources:

Map of Ohio; Activity sheets A, B, C, and D; "Is a Day without Agriculture Possible?"; and Math Worksheets

Premise:

Agriculture is Ohio's largest industry. Much of Ohio's economy depends on agriculture.

Objectives:

1. Learn that agriculture is more than just farming.
2. Recognize what industries are related to agriculture.

Motivation:

Since it is said that the farmer feeds the world, find out what this means.

How much do the students know?

1. What percent of the world's people are involved in agriculture?
2. What does industrial revolution mean?
3. What steps do raw products take before they reach the consumer?
4. How much variety is in a farmer's work day.
5. Do you know any farmers? What do they grow and produce?

Vocabulary:

1. Retail — sale to consumer
2. Wholesale — sale to the retailer
3. Revolution — change in operation as a result of the use of new machines

Trivia:

1. An American farmer feeds 114 people – 92 in the United States and 22 overseas.
2. American farmers produce just under 50 percent of the world's corn.
3. Farming isn't confined to land. We farm the oceans for fish and other seafood, and someday we may use "space" for production of our food supply.
4. Farming is the first recorded occupation of humans.

Ag Unit: **Ohio Agriculture Economics**

Core

Major: **Economics**

Minor: **Social Studies**
Language Arts

Related Lesson Plans

Careers in Agriculture

Remarks/Notes

Suggested Activities:

1. Guide the students in discussing the steps a raw product goes through before it reaches the consumer. Hand out "Ohio's Largest Industry" background.
2. Make a list of all the people involved in the handling of food.
3. Ask the students if their father or mother is involved in agriculture, and make a chart to compare to the 25 percent national average.
4. Have the students pick a product and follow it through its production processes.
5. Have the students list their relatives and, with the help of their parents, what their relatives do to see how many are involved in agriculture.
6. Use Activity Sheets A, B, and C (see answer key on page 11). Class discussion may lead to different answers for Activity Sheet C.
7. Use Activity Sheet D. Sources of which agricultural products are grown in your area include high school agricultural education teacher, County Cooperative Extension Service, County Soil and Water Conservation Service, and local farmers.
8. Use "Is a Day without Agriculture Possible? (see page 10). Use this for class discussion or students may write a short paper on what they use in school made from agricultural products.

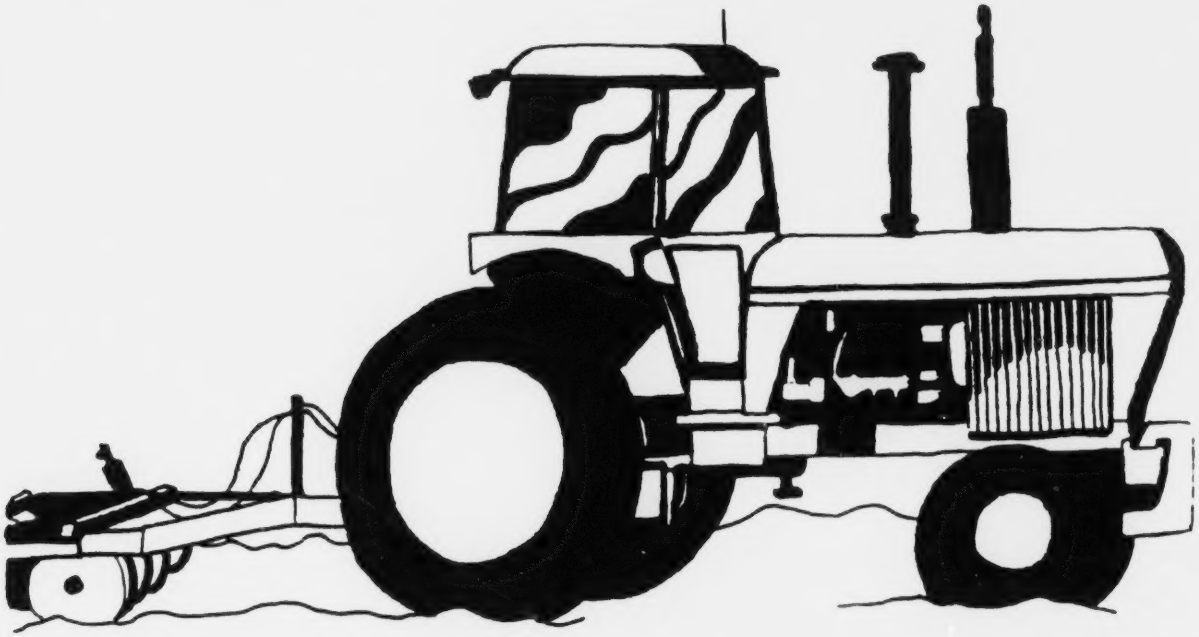


Illustration by Chris Schaber, student.

Name ______________________

Activity Sheet A

Matching: Write the letter of the word in the right hand column in the blank in the left hand column.

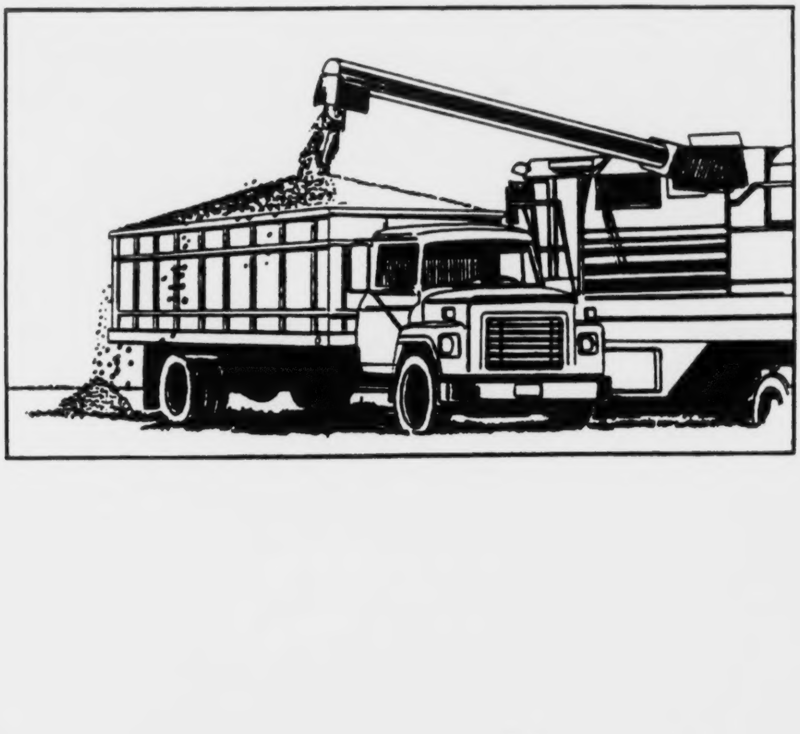
a. production
b. processing
c. distribution
d. retailing

1. _____ Tomatoes are cooked and canned to prevent spoilage.
2. _____ Tomato products are sold in stores.
3. _____ Tomatoes grow in fields on farms.
4. _____ Trucks haul tomato products to stores.
5. _____ Cows are usually milked twice a day.
6 _____ Students buy milk at school.
7. _____ Milk is taken from the processing plant to stores.
8. _____ Milk is put in bottles or cartons.

True or false:

9. _____ Silver and french fries both result from production and processing.
10. _____ The food you eat results from the work of many people doing different jobs.

Adapted with permission from "New York is Growing"



Name ______________________

Activity Sheet B

List each career in the proper space. If you can think of some careers that are not listed, you may add them also.

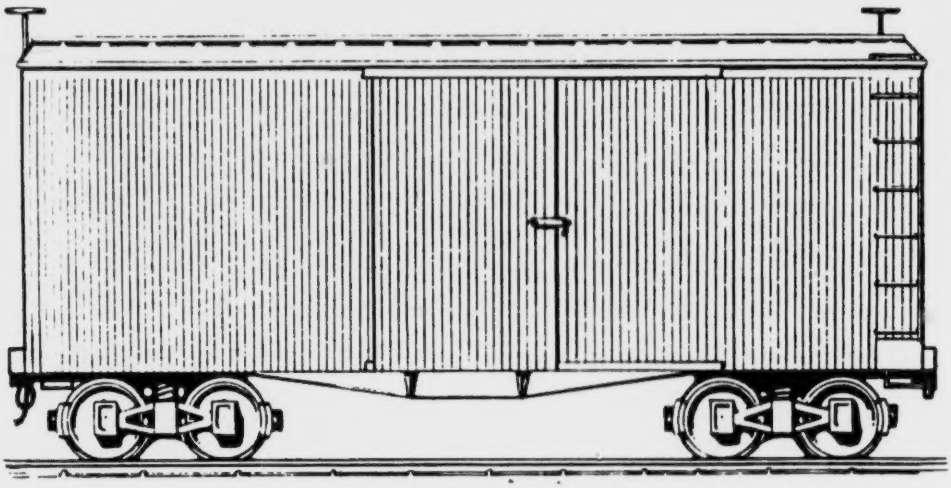
Farmer
Truck driver
Store clerk
Fruit picker
Factory worker
Shelf stocker
Railroad engineer
Restaurant owner
Factory owner
Plant manager
Product salesperson

Production

Processing

Distribution

Retailing



Name ________________________________

Activity Sheet C

Circle the products that are typically sold in the "raw" state to the consumer. Many products are sold in more than one form. Circle it if usually available in stores, fresh.

A Partial List of Agricultural Products from Ohio

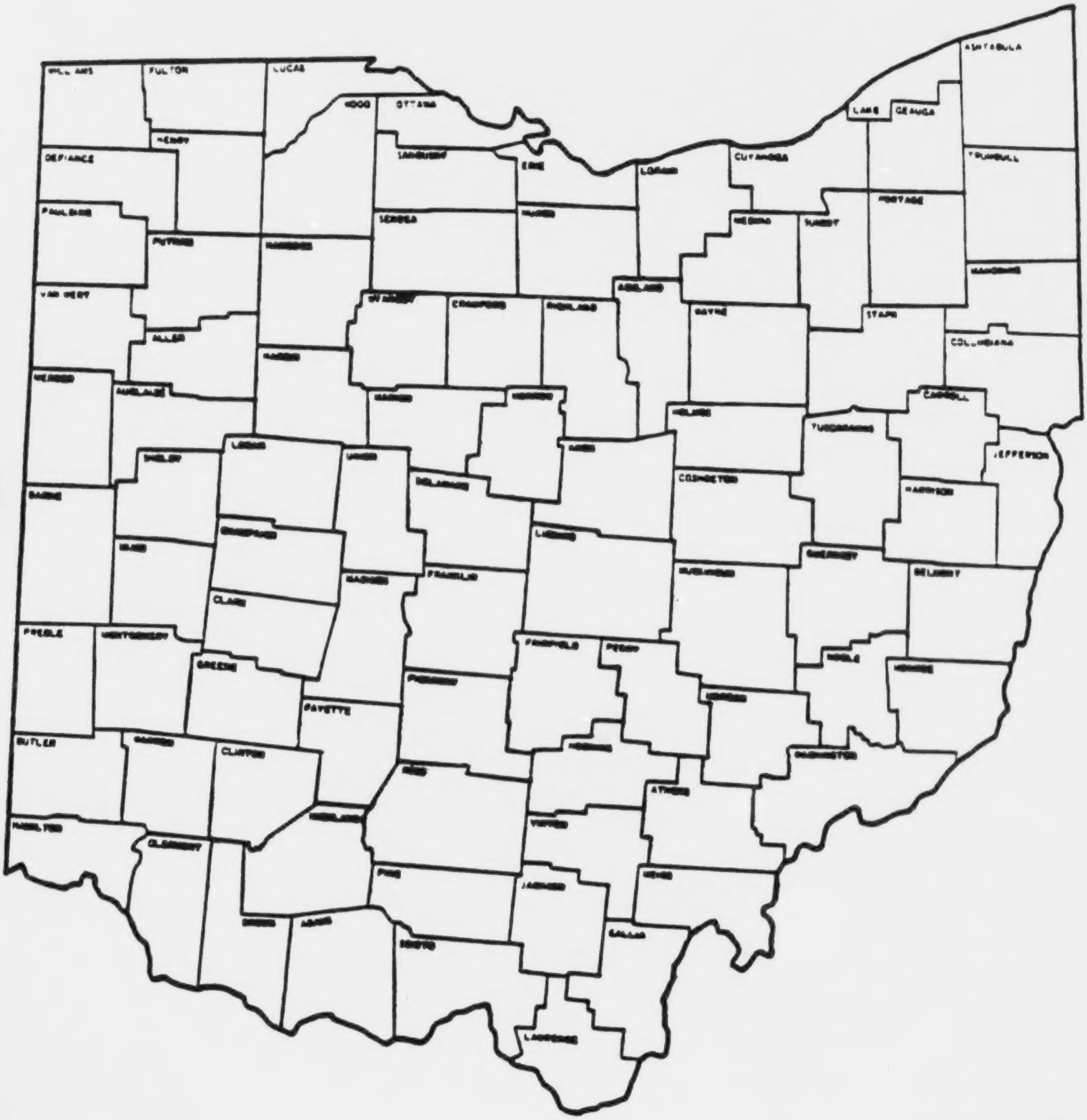
A alfalfa pellets
animal feed
apples
apple cider
B bacon
bean sprouts
beef
beverages
bird seed
bologna
bread
butter
C cabbage
canola
candy
carrots
catsup
celery
cheese
chicken
Christmas trees
clover seed
corn
corn syrup
crackers
cream
D dairy cattle
dog food
duck
E eggs
egg products
evaporated milk
extracts
F farm supplies
fats
feed additives
fertilizers
flavorings
flour
flower bulbs
fructose
fruit juices
G garlic salt
gourmet food
grape juice
grass seed
green beans
H hamburger
ham
hardwoods
hay
hides
hogs
honey
horseradish
horses
hot dogs
I ice cream
ice milk
infant formula
J jam
jellies
juice drinks
K kale

L lamb
lard
leather
livestock feed
luncheon meat
M maple syrup
margarine
mayonnaise
melons
milk
mink fur
mushrooms
N noodles
nuts
O oats
onions
ornamental trees
P pasta
peaches
pears
peppers
pickles
popcorn
pork
potatoes
potato products
poultry feed
pumpkins
Q quail
R rabbit
radishes
raspberries
S salad dressings
sauerkraut
seed corn
shade trees
sheep
soft drinks
sour cream
soybeans
spices
straw
strawberries
sugarbeets
sweet corn
T timber
timothy seed
tobacco
tofu
tomatoes
tomato products
turkey
turkey products
U urea products
V veal
vegetables
veneer
vinegar
W wheat
wine
Y yeast
yogurt
Z zucchini

Adapted with permission from the Ohio Department of Agriculture's brochure, "The A.B.C's of Ohio Agriculture."

Activity Sheet D – Map of Ohio

What is your location in Ohio? Put a star near where you live. Write in the names of the crops or agricultural products that are produced in your area. Use Activity Sheet C to identify the wide variety of products produced in Ohio.


ASHTABULA
FULTON
LUCAS
WOOD
OTTAWA
LAKE
GEAUGA
DEFIANCE
ERIE
LORAIN
CUYAHOGA
TRUMBULL
PAULDING
SENECA
MEDINA
SUMMIT
PORTAGE
MAHONING
VAN WERT
CRAWFORD
RICHLAND
ASHLAND
WAYNE
STARK
ALLEN
COLUMBIANA
CARROLL
HOLMES
TUSCARAWAS
JEFFERSON
LOGAN
SHELBY
UNION
DELAWARE
COSHOCTON
HARRISON
FRANKLIN
BELMONT
CLARK
PREBLE
MONTGOMERY
FAIRFIELD
PERRY
NOBLE
GREENE
MONROE
FAYETTE
BUTLER
CLINTON
WASHINGTON
ATHENS
HAMILTON
CLERMONT
PIKE
MEIGS
ADAMS
SCIOTO
GALLIA
LAWRENCE

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Is a Day Without Agriculture Possible?

We depend upon agriculture for much more than just our food and clothing. Let's take a look at an average day and some of the agricultural products and byproducts you might use.

You wake up on sheets of cotton that have been woven with cornstarch for sizing. You turn on the transistor radio — the dry cell batteries contain cornstarch. You step out of bed onto a carpeted floor. The rug pad underneath the carpet is made with hair from the hide of cattle. As you reach for your robe, you might notice how warm it is in the house. The insulation used in the walls is produced with a byproduct from cattle and hogs. The plaster on the walls is made with a binder produced from the hide of hogs and cattle. The wallboard also contains cornstarch and soyflour from the soybean.

The soap you use to wash your face is made from byproducts of corn, soybeans and cattle. The comb you use to comb your hair is a byproduct of cattle.

At the breakfast table, you notice that everything came from agriculture in some form or another. The food might have been made sweet by a corn sugar called fructose. As you eat, you remember your homework assignment that you finished last night, the paper you wrote it on, contains a corn and soybean byproduct that helped hold the ink.

The tires on the school bus are made with a byproduct of beef, stearic acid, that is very important to make the tires run cooler, therefore, they last longer. The bus might be fueled by gasohol which is grain alcohol made from corn and gasoline.

You arrive at school ready for a great day made possible by agricultural byproducts.

Can You Finish the Story Using Other Agriculture Products?

(Possible list teacher may use for discussion)

A list of farm products that you use each day.

Cereal
Eggs
Milk
All fruit
Toast
Tires
Lunch
Meat
Paper
Paperbacks
Lettuce
(The list is endless)

Potato chips
Baked potato
Pizza
Buns
Clothes
Shirt
Woolen sweater
Leather shoes
Stockings
Underwear
Sugar

Flour
Shortening
Margarine
Butter
Raisins
Nuts
Steak
Hamburger
Pork chops
Bacon

Sheets
Blankets
Feather pillow
Cotton nightwear
Mattress
Bed stead
Cocoa
Tea
Macaroni

Reprinted with permission from, "Bread Basket of the World," Agriculture in Iowa curriculum guide.

Activity Sheet A – Key

1. b
2. d
3. a
4. c
5. a
6. d
7. c
8. b
9. true
10. true

Activity Sheet B – Key

Production
farmer
fruit picker

Processing
factory worker
factory owner
plant manager

Distribution
truck driver
railroad engineer
product salesperson

Retailing
store clerk
shelf stocker
restaurant owner

Activity Sheet C – Key

apples
bean sprouts
beef
bird seed
cabbage
carrots
celery
chicken
Christmas trees
clover seed
eggs
flower bulbs
grass seed
green beans
hamburger
kale
mushrooms
nuts
onions
ornamental trees
peaches
pears
peppers
pork
potatoes
pumpkins
radishes
raspberries
shade trees
strawberries
sweet corn
timothy seed
tomatoes
turkey
veal
vegetables
zucchini

Name ______________________________

Unit: Ohio's Largest
Industry

Worksheet 1: **Ohio Agriculture**

(Addition)

1. Ohio has 84,000 farms. Write this number in words. ______________________________

____

2. On January 1, 1988 the number of head of livestock in Ohio was estimated at one million, eight hundred and twenty thousand cattle and calves; twenty-four million, six hundred thousand chickens; three million, four hundred thousand turkeys; two million, one hundred thousand hogs; and two hundred and seventy thousand sheep and lambs. Write the numbers for these livestock and total them .

_______________ Cattle and calves

_______________ Chickens

_______________ Turkeys

_______________ Hogs

_______________ Sheep and lambs

TOTAL _______________ Livestock in these categories in Ohio

3. Write in words, the number of livestock in Ohio. ______________________________

____

4. More than seventy-three million pounds of strawberries were produced in Ohio in a recent year. Write the number for this figure.

___________________________ Pounds of strawberries

5. 47,250 tons of cucumbers are produced in Ohio in a typical year to be processed. Write this number in words.

____

____ Tons of cucumbers

6. The average cow produces thirty thousand glasses of milk in one year. In ten years she will produce 300,000 glasses of milk. Write the words for that many glasses of milk.

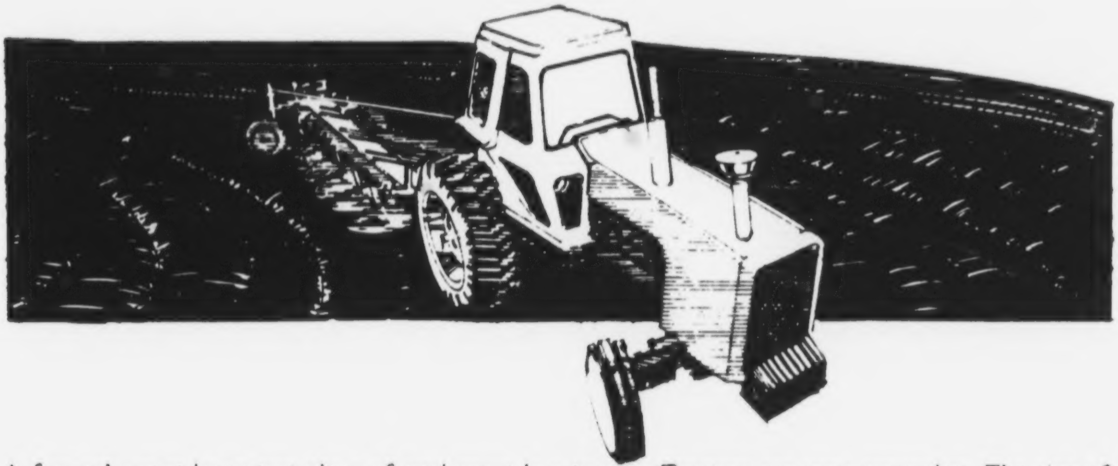
____

Adapted from "New York Is Growing," New York.

Name ____________________

Worksheet 2: **Farming is Expensive Business**

(Division)



A farmer's most important piece of equipment is a tractor. Tractors are very expensive. The size of a farmer's farm and the kind of crops he grows will determine what kind of tractor or how many tractors a farmer will own.

An average size farm tractor costs about $45,000. Calculate how many of the following items you could buy for the price of this tractor. (Please show your work.)

Example

1. How many cars at $9,000 each?

$$\begin{array}{r|l} \$9{,}000 & \overline{\$45{,}000} \\ & \underline{45{,}000} \\ & 00{,}000 \end{array}$$

___5___ cars

2. How many jeans at $15 a piece?

________ jeans

3. How many bicycles at $90 apiece?

________ bicycles

4. How many New Kids on the Block cassette tapes at $9 each?

________ cassette tapes

Printed with permission from Agriculture in Montana Schools, Montana

Name ______________________

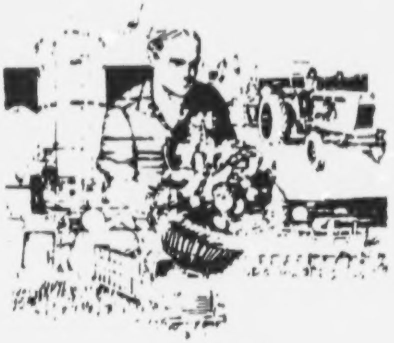
Unit: Ohio's Largest
Industry

Worksheet 3: Agricultural Statistics

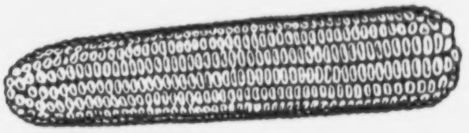
(Fractions and Percentages)

1. About two-thirds (2/3) of the people in the world are farmers. Calculate, to the nearest tenth, the percent of the world's people who produce food and fiber.

   ________ percent of the world's people



2. In the United States, one out of fifty people are farmers.
   - a. What fraction is this? ________ are farmers
   - b. What percent of the people in the United States are involved with farming? ________ are farmers
3. One out of every four jobs in the United States is linked to agriculture.
   - a. What fraction is this? ________ of the jobs
   - b. What percent of the people in the United States have jobs that help farmers produce food for you? ________ of the jobs
4. In 1930, 100 million acres of land were planted to corn in the United States. Today, only 75 million acres of land are planted to corn.



   - a. What fraction is planted to corn today vs. 1930? ________ of corn planted
   - b. What percent is this? ________ of corn planted
5. Today, farmers in the United States export one out of every three bushels of corn they produce.
   - a. What fraction is this? ________ of corn produced
   - b. What percent is this? ________ of corn produced
6. In Australia, three-fifths (3/5) of the people are farmers.
   - a. What percent is this? ________ are farmers

Adapted from "New York Is Growing," New York

Worksheet 1 – Key: Ohio Agriculture

1. Eighty-four thousand
2. 1,820,000 cattle and calves
   24,600,000 chickens
   3,400,000 turkeys
   2,100,000 hogs
   270,000 sheep and lambs
   32,190,000 total
3. Thirty-two million, one hundred ninety thousand
4. 73,000,000
5. Forty-seven thousand, two hundred and fifty
6. Three hundred thousand

Worksheet 2 – Key: Farming Is Expensive Business

1. 5 cars
2. 3,000 jeans
3. 500 bicycles
4. 5,000 cassette tapes

Worksheet 3 – Key: Agricultural Statistics

1. 66.7%
2. a. 1/50
   b. 2%
3. a. 1/4
   b. 2%
4. a. 3/4
   b. 75%
5. a. 1/3
   b. 33.3%
6. 60%

Name ____________________

Ohio's Largest Industry

What Have You Learned?

Imagine you live on a farm. Write a story about a cousin from the city that visits you for the first time.

OR

Pretend you are a field mouse trying to sell farm products to a house mouse.

Agribusiness
Unit 5

Farm Value

Background — Farm Value

The farmer doesn't receive every dollar that is spent for food. The **farm value** of every dollar spent on food is only 27¢ (1984).* Where does the rest go? The breakdown on the average dollar spent on food is like this (1984). (The following are average figures):

27¢	**Farm value:** the amount the farmer receives.
33¢	**Labor:** how much people were paid for working.
8¢	**Packaging:** the cost of the container.
5¢	**Intercity transportation:** delivering the product.
5¢	**Before-tax profits:** how much the material was marked.
4¢	**Rent and depreciation:** machinery costs.
4¢	**Fuels and electricity:** energy to produce and package.
2½¢	**Advertising:** letting people know about the product.
2¢	**Interest:** cost of borrowing money.
1¢	**Repairs:** maintenance of equipment.
8½¢	**Other costs:** (property taxes, insurance, accounting, professional services, promoting, bad debts, miscellaneous items)

The total marketing bill share of the food dollar was 73 cents and the farm share was 27 cents. The farm value share is what the farmer receives from the amount consumers spend on a market basket of foods purchased in retail foodstores. A decline in the share means that prices received by producers have declined in relation to prices in foodstores. Note in the products listed below, the fewer services performed on the product the higher the farm value. A good example is fresh potatoes compared to frozen french fries.

---

*Pro farmer, April 20, 1985, Vol. 13, No. 16

Farm value share of foodstore prices.*

Food	1987 retail price	Farm value	Farm value share of retail price
	(dollars)		(percent)
Eggs, Grade A large (1 doz)	0.78	0.48	62
Choice beef (1 lb)	2.42	1.38	57
Chicken broiler (1 lb)	0.78	0.39	50
Milk (½ gal)	1.14	0.56	49
Pork (1 lb)	1.88	0.83	44
Frozen orange juice (12 fl oz)	1.11	0.42	37
Cheese, natural cheddar	3.06	1.10	36
Sugar (1 lb)	0.34	0.12	35
Potatoes, Northeast (10 lb)	2.40	0.62	26
Peanut butter (1 lb)	1.80	0.46	26
Flour, wheat, all-purpose (5 lb)	1.02	0.27	26
Shortening (3 lb can)	2.33	0.44	19
Oranges, California (1 lb)	0.55	0.10	18
Margarine (1 lb)	0.69	0.12	17
Lettuce (1 lb)	0.59	0.10	17
Rice, long grain (1 lb)	0.40	0.06	15
Potatoes			
Frozen french fried (1 lb)	0.69	0.08	12
Tomatoes (1 lb can)	0.51	0.05	9
White bread (1 lb)	0.55	0.04	7

Computed from unrounded data.

*Food Costs...From Farm to Retail, USDA Economic Research Service, April 1988.

Here are two examples of where the food dollar goes. The important point to remember is that not all monies spent on food go to the farmer. On a loaf that costs higher than 54 cents, the farm share remains the same at 5 cents based on a 1 pound loaf of bread. The farm-retail price spreads are included in livestock too.

Let's look at what happens to a loaf of bread that costs 54¢.*

Farm ingredients:	
Wheat cost	4.4¢
Other ingredients (yeast, etc.)	.6¢
	5.0¢ total
Non-farm ingredients and other costs (preservatives, water, etc.)	2.0¢
Delivery of wheat to miller	1.0¢
Flour milling	1.0¢
Delivery of flour to baker	1.0¢
Bread baking and selling	35.0¢
Wholesaling and retailing	9.0¢
	54.0¢ total

*What's Happening to Food Prices USDA, Economic Research Service, April 1983.

Let's look at what happens to a 1,000-pound steer on its way to the super market.

The farmer sells the steer for 50¢/lb	1,000 lb × 50¢	=	$500 for steer
The packer kills and dresses the steer; the carcass now weighs 620 pounds	$500 ÷ 620 lb	=	80.6¢/lb
Lose 180 pounds to non-edible parts: bone, fat and some moisture, along with some meat, leaving 440 pounds of meat	$500 ÷ 440 lb	=	$1.14/lb
Cost of the meat		=	$1.14/lb
Other costs to be added:			
Slaughter (killing the steer)	@ 10¢ lb		
Transportation	@ 4¢ lb		
Labor (cutting and processing)	@ 23¢ lb	=	44¢/lb added
Packaging	@ 5¢/lb		
Advertising	@ 2¢/lb		
Total cost (meat and other costs)		=	$1.58/lb
The 440 pounds of beef @ $1.58/lb = $695.20			

Adapted with permission from "People on the Farm: Raising Beef Cattle," USDA, December 1978.

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SEEDS

LIBERTY
IN GOD WE TRUST
1987

IN GOD WE TRUST
LIBERTY
1987

IN GOD WE TRUST
LIBERTY
1987

LIBERTY
IN GOD WE TRUST
1987

Lesson: **Farm Value**

Resources:

2 Food Dollar charts, newspaper foods section, bulletin board.

Premise:

The American farmer receives a small portion of every dollar spent on food. Costs of processing, labor and packaging account for the majority of cost.

Objective:

Identify farm value and market value of food costs.

Specific things to look for:

Farmers don't receive every dollar spent by the consumer for food items.

Motivation:

How much do the students know?

1. Begin a discussion by asking how much a loaf of bread costs.
2. How much do you think the wheat costs that goes into this bread?
3. Where do you think the rest of the money goes?

Vocabulary:

1. Farm value — the value of agricultural products received
2. Marketing value — the value of labor, advertising, rent and depreciation. Transportation and other costs do not relate to ingredient costs.

Trivia:

1. The farm value of food eaten in restaurants is only 15 cents of every dollar.

Ag Unit: **Ohio Ag Economics**

Core

Major: Economics

Minor: **Mathematics**

Related Lesson Plans

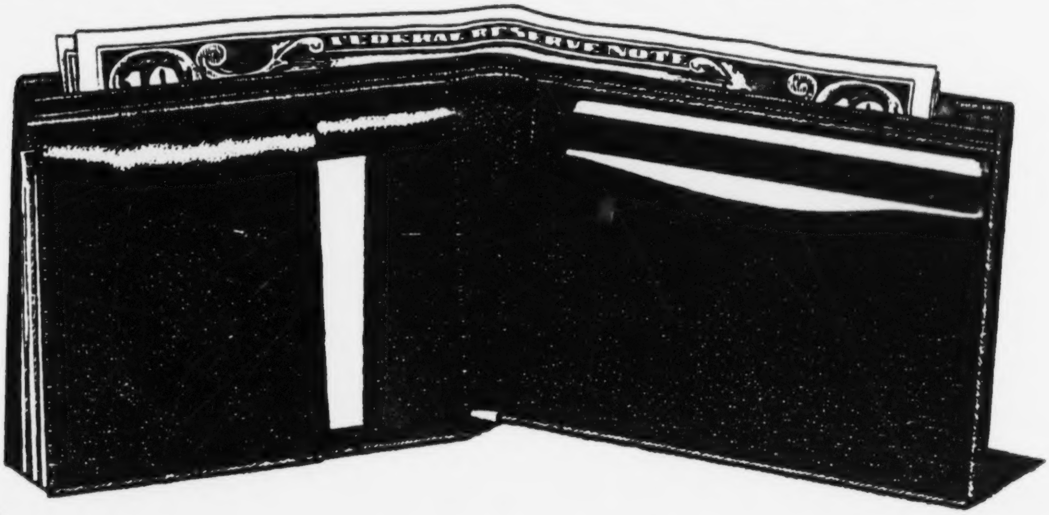
Ohio's Largest Industry

Remarks/Notes

Suggested Activities:

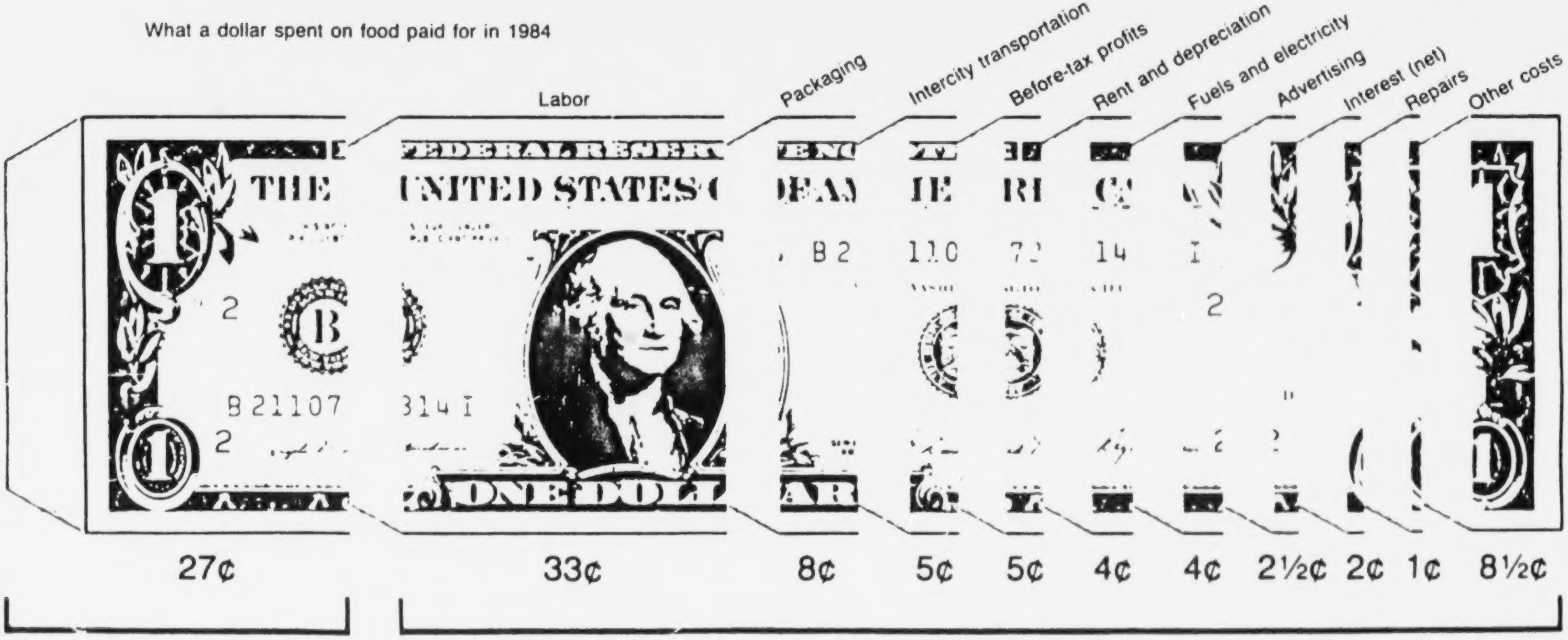
1. Of the $285 billion spent on agricultural goods in 1983, $200 billion was spent on processing, retailing and transporting the goods. The farmer receives these average amounts on goods sold:
   - 35¢ per dollar spent in grocery stores for U.S. farm grown food.
   - 57¢ per $1 spent for beef.
   - 56¢ for eggs sold at 91¢.
   - 5¢ for the wheat in a 54¢ loaf of bread.
   - 55¢ for a $1.12 half-gallon of milk.

   Tell the students these facts and discuss with them where the remaining money goes. The charts (Your Food Dollar) can assist you in the discussion (page 7).
2. Recall previous discussions of various workers and businesses involved in getting goods from the farmer to the consumer.
3. Pose the question: Which is less expensive — to eat at a restaurant or to eat at home? Find the answer by looking in the newspaper for ads comparing grocery items to restaurant dinners. (Example: fresh chicken vs. a prepared fried chicken dinner.)
4. Point out that each worker involved in the processing and marketing system must be paid a wage. The involvement of fewer workers results in a lower cost for the product.
5. Use the accompanying model for a bulletin board illustrating how the consumer's food dollar must be divided among workers (page 7).
6. Concluding discussions should elicit from students the least expensive way consumers may purchase foods (directly from the farmer) and the most expensive way (fully prepared at a restaurant).
7. Recall reasons that less processed foods are less expensive than more processed foods.
8. This process may also be used for the production of fiber products, such as jeans or t-shirts using the following production steps: cotton farmer, textile mill, clothing manufacturer, wholesaler, store, consumer.
9. Students may role-play a situation in which each person involved in the production of the food or fiber product defends the cost (value added) of his step in the production.



Your Food Dollar

What a dollar spent on food paid for in 1984



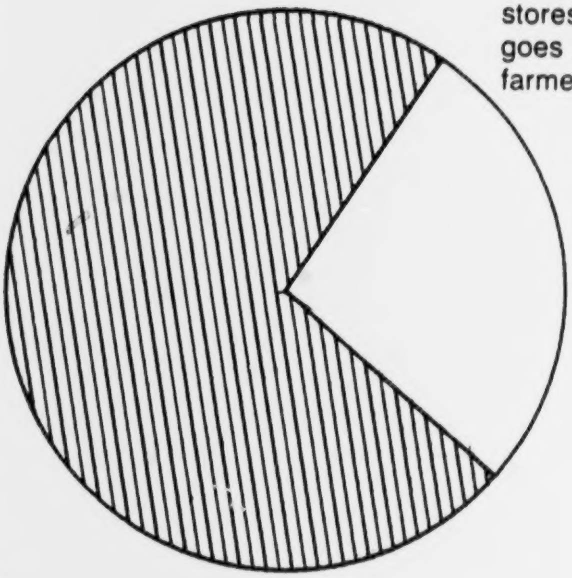
Farmer 27¢

Others 73¢

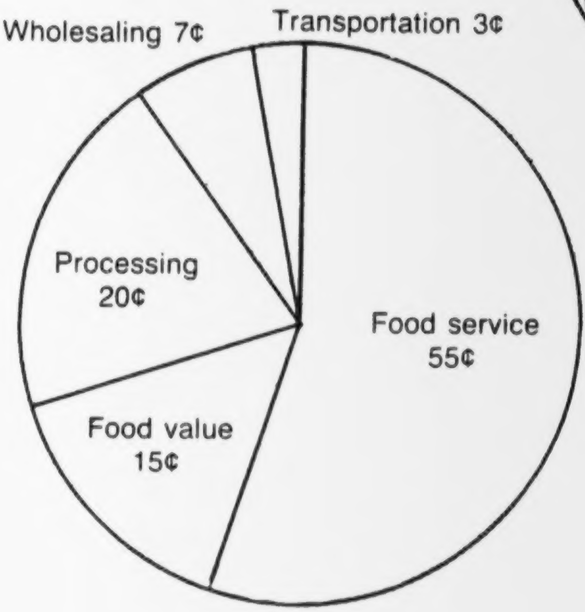
Includes food at home and away from home. Other costs include property taxes and insurance, accounting and professional services, promotion, bad debts and many miscellaneous items.

BEST COPY AVAILABLE

Your Food Dollar

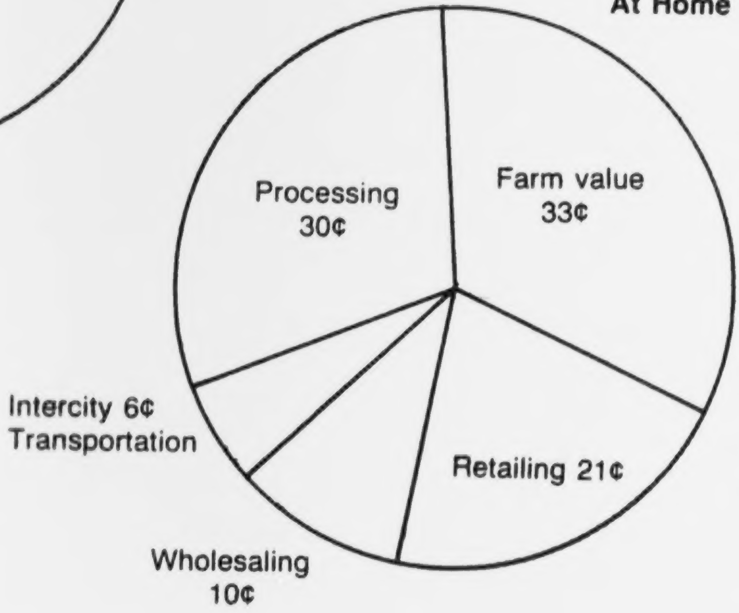


Approximately 27¢ of every $ spent in grocery stores on food goes to the farmer



Away from home

At Home



Name ______________________

Worksheet: Buy a Farm Animal

(Multiplication)

Write the total price of each animal on the line.

Steer
$0.55 a pound
1,300 pounds
Cost of steer ______________

Turkey
$1.20 a pound
7 pounds
Cost of turkey ______________

Sheep
$0.67 a pound
137 pounds
Cost of sheep ______________

Chicken
$0.47 a pound
4 pounds
Cost of chicken ______________

Pig
$0.43 a pound
213 pounds
Cost of pig ______________

Name ____________________

Farm Value — What Have You Learned?

True or False

________ 1. Farmers receive all the money for food.

________ 2. Farm value is what the farmer receives.

________ 3. Farm value for bread is 50 cents.

________ 4. The largest cost in breadmaking is baking and selling.

________ 5. Advertising food is a cost added to the food.

________ 6. Processing adds to the price of food.

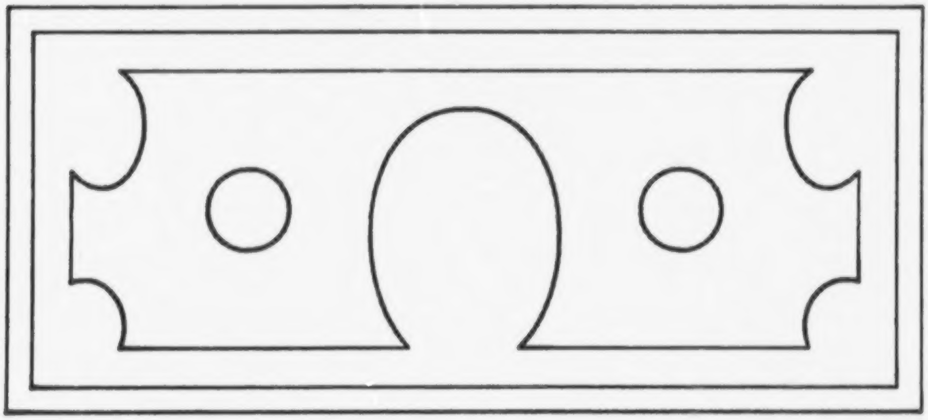
________ 7. The majority of the food dollar is marketing costs.

________ 8. More people than farmers depend on food prices.

________ 9. Labor is a small cost in food prices.

________ 10. Labor costs are more than farm value.

Bonus: On this dollar bill, draw a line to represent the Farm Value of food. Label the line with the amount it's worth.



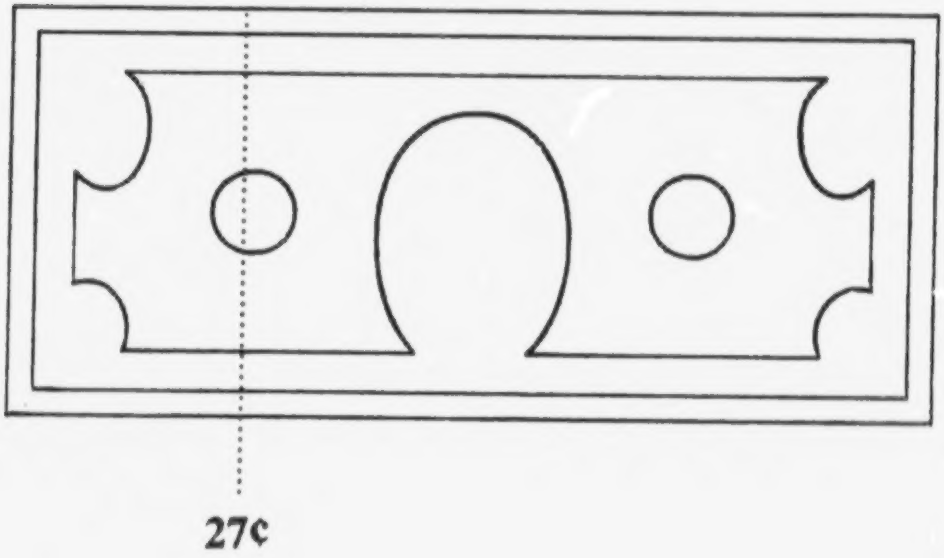
Worksheet Key – Buy a Farm Animal

Steer	$715.00
Turkey	$8.40
Sheep	$91.79
Chicken	$1.88
Pig	$91.59

Farm Value Key – What Have You Learned?

1. false
2. true
3. false
4. true
5. true
6. true
7. true
8. true
9. false
10. true

Bonus: Line should be slightly above 25 cents.



Agribusiness
Unit 6

Cooperatives

Background — Cooperatives

Our community has many businesses: farms, banks, gas stations, grocery stores, clothing and furniture stores, insurance companies, etc. These businesses trade things of value (food, gas, clothing, furniture, insurance, etc.) for money. They may produce a product (farms), or distribute and sell goods (grocery stores), or they may sell a service (TV repair) (see page 5).

All business firms are organized in one of three ways: (1) by an individual, (2) by partners or (3) as corporations (see page 6). Corporations can be owned by investors who probably are not the customers of the business, or they can be owned by members who are the customers of the business. When a corporation is owned by members who use the business, it is called a cooperative.

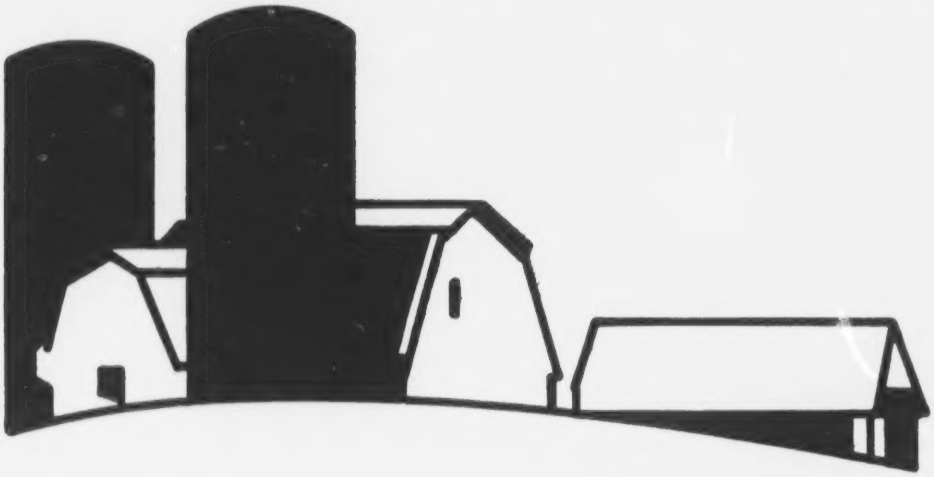
People cooperate to gain mutual benefit for themselves and others (see page 7). People work together (cooperate) to do something that probably could not be done individually. They work together when they see that a cooperative effort will make it easier to get a job done.

Early forms of cooperatives in this country were joint efforts by settlers to clear land, build roads and houses and harvest crops (see page 8). Businesses first started out of wagons, then out of buildings. Merchants worked together to market products and pool orders for supplies in these businesses (see page 9).

The two types of cooperation are **informal**, such as two people loading bales of hay on a wagon or two people pushing a car out of a ditch and **formal**, when it is realized that the informal or temporary arrangement is unable to provide lasting mutual benefit (see page 10).

A formally organized cooperative is a business owned and controlled by its members and operated to provide its members with goods or services as a **nonprofit operation**. That is, if there is any money left over after the costs of doing business are paid, it is returned to the members according to the amount of business each member did with the cooperative. The members of a cooperative elect a board of directors who in turn hire the manager who runs the day-to-day business.

In summary, a cooperative is a business, owned by its members, who are the customers. It is a **democratically controlled** organization since its members (on a one-man, one-vote basis) elect the officers of the business. It is a **nonprofit operation** since any money left over after paying operating costs is returned back to its **members/users** (See page 11).



Lesson: Cooperatives

Resources:

Overhead visuals supplied with Lesson Plan, Ohio Council of Farmer Cooperatives for teaching materials and aids, names and addresses of local cooperatives.

Premise:

Cooperatives are an important form of business. Students very likely will be exposed to cooperatives in their lifetimes and some may belong to a cooperative one day.

Objectives:

Students will gain an understanding of cooperatives and the role they play in today's communities.

Specific things to look for:

Cooperatives are evident in all communities. They may be consumer food cooperatives, credit unions, farmer cooperatives, rural electric cooperatives, milk marketing cooperatives, Production Credit Association, Federal Land Banks, etc.

Motivation:

1. How much do students know about cooperatives and what they are?
2. How do cooperatives affect student's families?
3. What impact do cooperatives have in the community?

Vocabulary:

1. Cooperative – a business formed by a group of people to obtain certain services for themselves more effectively or more economically than they can obtain them individually.
2. Informal cooperation – cooperation that starts with two or more people starting a joint effort to perform a certain job or supply needed goods and services.
3. Formal cooperation – that which forms when people discover that informal or temporary arrangements are unable to perform the job, attain the services or maximize the benefits or efficiencies desired.
4. Nonprofit operation – in a cooperative if there is any money left over after the costs of doing business are paid, it is returned to the members according to the amount of business each member did with the cooperative.
5. Democratic control – refers to the feature of cooperatives that each member usually has one vote.
6. Member/User – the people own, finance, and operate the business for their mutual benefit.

Ag Unit: **Ohio Ag Economics Core**
Major: **Social Studies**
Minor: **Economics**

Related Lesson Plans

Ohio's Largest Industry

Farm Value

Remarks/Notes

Trivia:

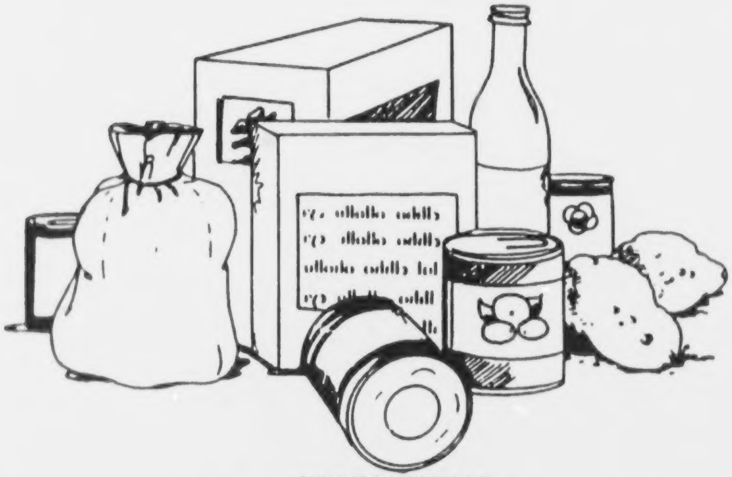
1. Benjamin Franklin helped organize the first cooperative in the United States in 1752 – "the Philadelphia Contributorship for the Insurance of Homes from Loss of Fire." This cooperative continues to operate today.
2. There are over 5,600 cooperatives in the United States today with membership of over 94 million.
3. There are 185 farmer/member cooperatives in Ohio with membership over 149,000.
4. Thirty percent of Ohio's dairy farmers belong to cooperatives.
5. One third of all the grain marketed in Ohio is sold through cooperatives.

Suggested Activities:

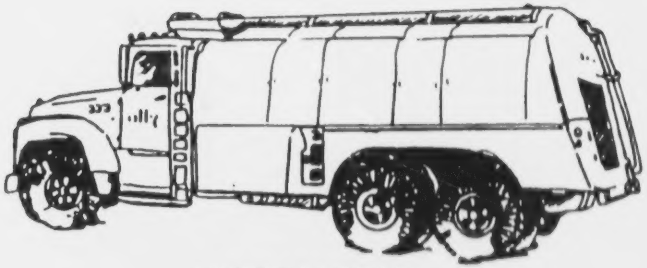
1. Discuss with students the various types of businesses in your community and the forms of business organization. This will lead you into a cooperative form of organization. Discuss what a cooperative is, why they are formed, and how they operate.
2. Have students identify cooperatives they may be familiar with in their community and what they think the cooperative does.
3. Identify for the students the various cooperatives in your community (may be local electric company or telephone company).
4. Arrange a field trip to one of your community's cooperatives and have the manager (or a director) explain what the cooperative is, who are their members, what services they provide to members, etc.
5. Have the class discuss and take them through the process of a cooperative class effort to help solve some problem (planning a field trip or a party). This effort should help them understand how working together can make it easier to get a job done.
6. For additional materials on cooperatives, please contact:

   Ohio Council of Farmer Cooperatives
   The Ohio State University
   Room 238, 2120 Fyffe Road
   Columbus, OH 43210
   (614) 292-6387

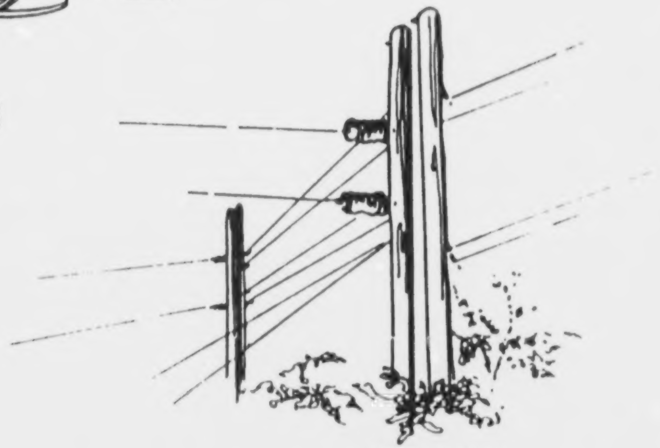
WHAT TYPES OF COOPERATIVES ARE OPERATING?



MARKETING



PURCHASING



SERVICE

5

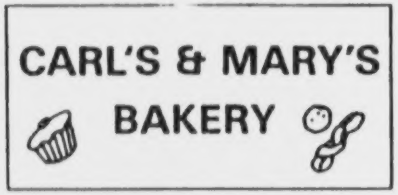
Unit 6 – Cooperatives

WHERE DOES A COOPERATIVE FIT IN THE AMERICAN PRIVATE COMPETITIVE ENTERPRISE SYSTEM?

TYPES OF BUSINESSES:

JOE'S T.V. REPAIR

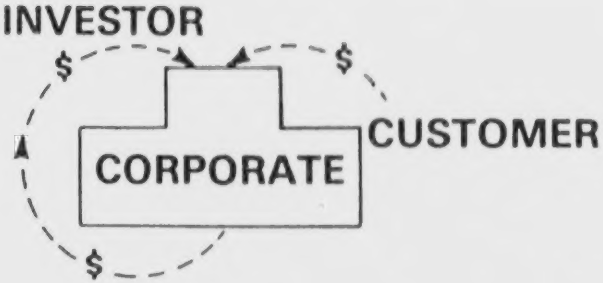
INDIVIDUAL


CARL'S & MARY'S
BAKERY

PARTNERSHIP

NORTHERN HARDWARE INC.

CORPORATE


INVESTOR
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CUSTOMER
CORPORATE
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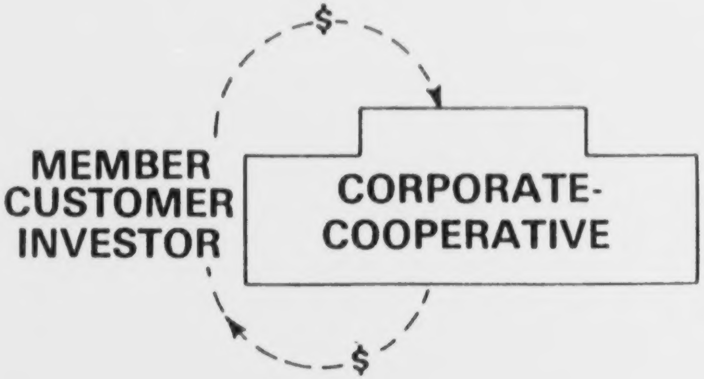
$
MEMBER
CUSTOMER
INVESTOR
CORPORATE-
COOPERATIVE
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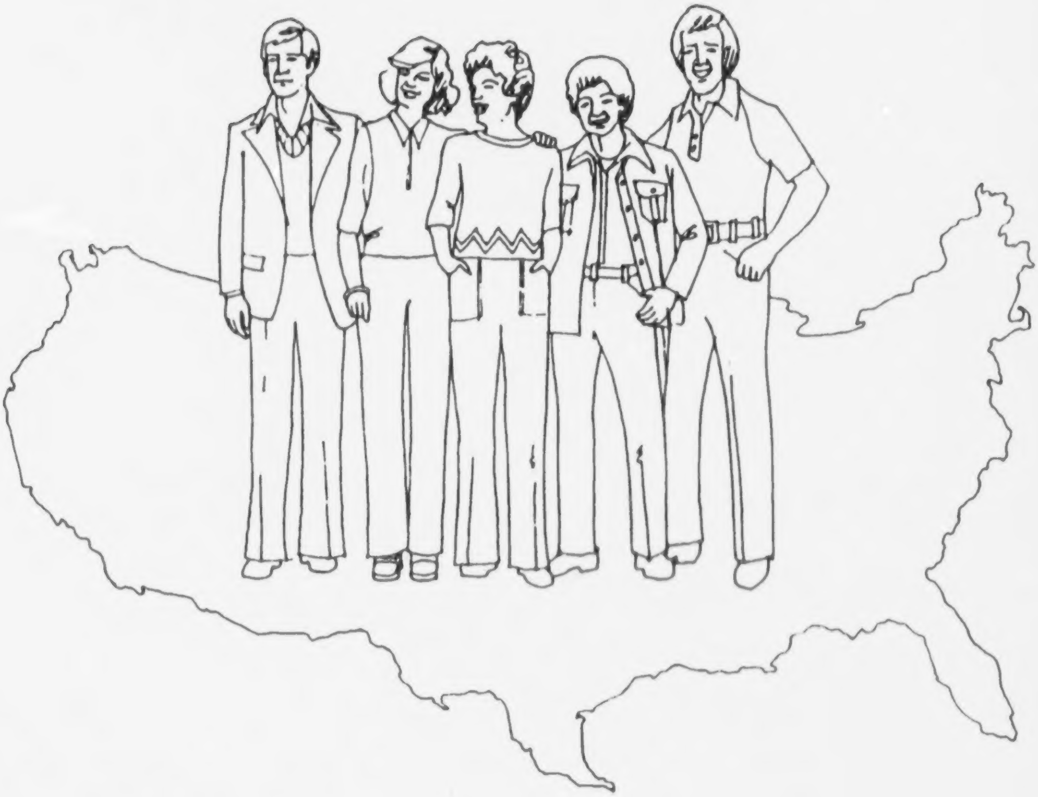
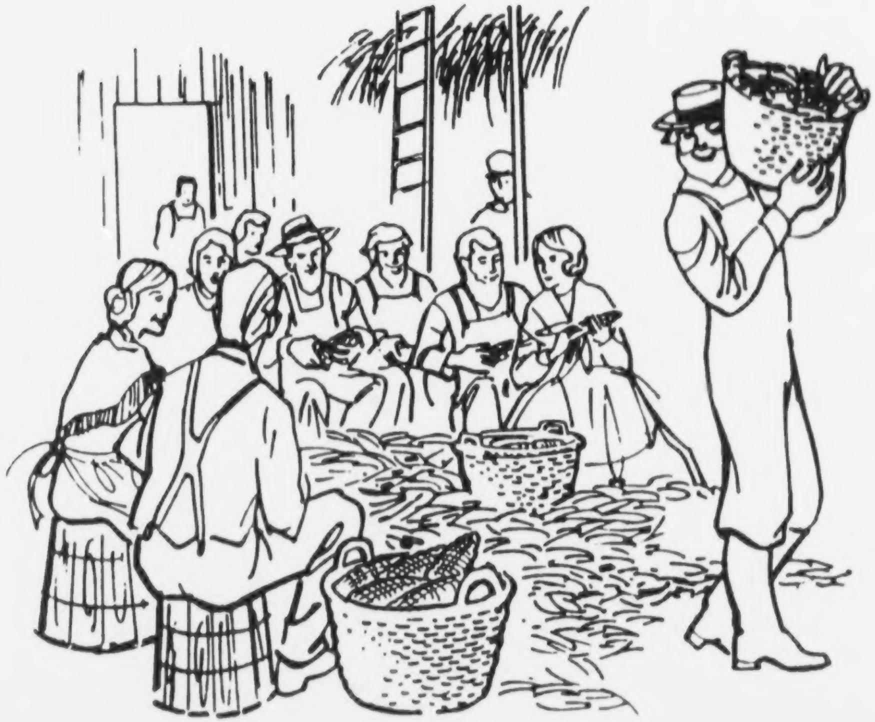
WHY COOPERATE?

- FOR MUTUAL BENEFIT

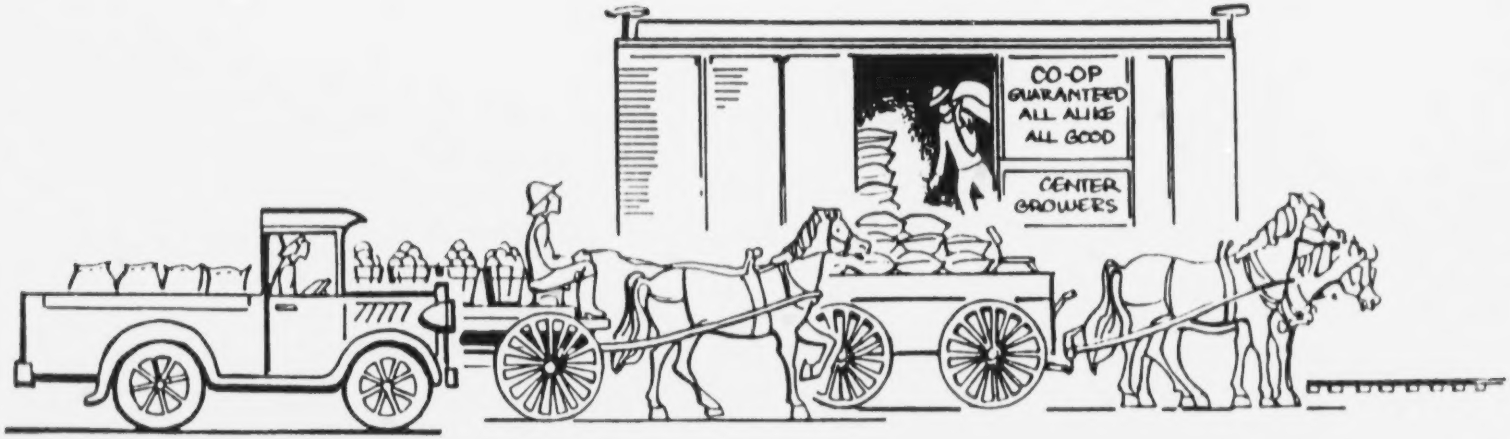


BEST COPY AVAILABLE



What were early forms of cooperation in this country?

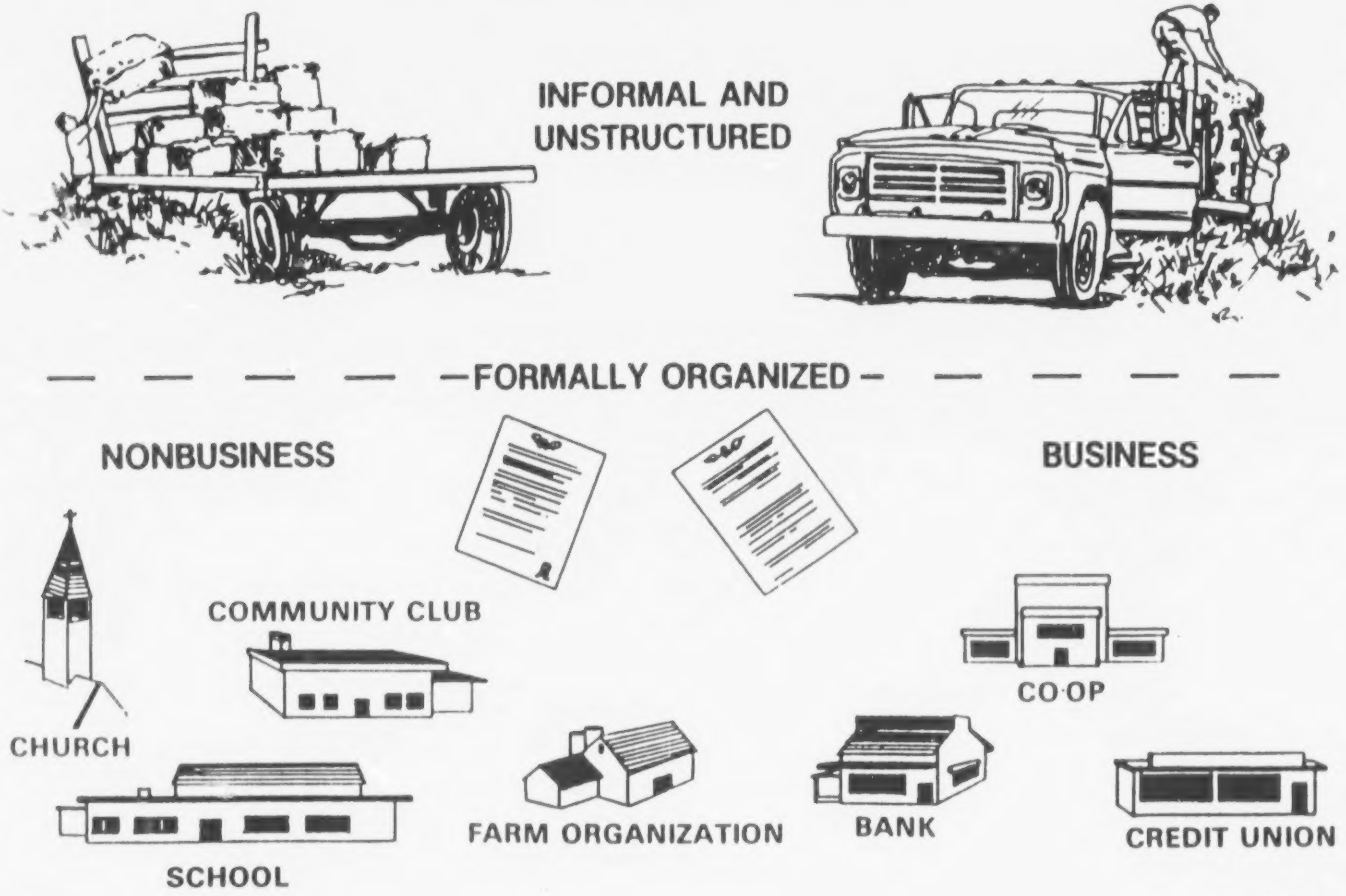
- land clearing and road building
- house and barn raising
- threshing rings
- corn husking bee
- community protection


CO-OP
GUARANTEED
ALL ALIKE
ALL GOOD
CENTER
GROWERS

How did early cooperative business activity develop?

- marketing products
- pooling orders for supplies

WHAT ARE TWO BASIC TYPES OF COOPERATION?



INFORMAL AND UNSTRUCTURED

—FORMALLY ORGANIZED—

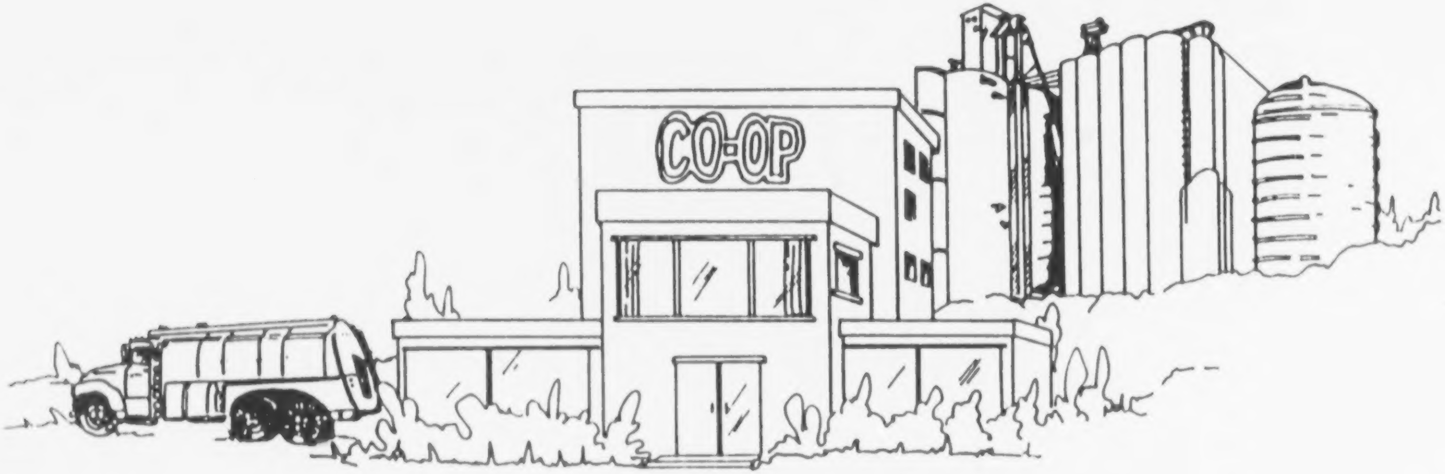
NONBUSINESS

BUSINESS

CHURCH
COMMUNITY CLUB
SCHOOL
FARM ORGANIZATION
BANK
CO·OP
CREDIT UNION

10

WHAT IS A COOPERATIVE BUSINESS?



A cooperative is a business voluntarily owned and controlled by its users and operated for them on a nonprofit basis.

Name ______________________

Cooperatives — What Have You Learned?

True or False

______ 1. People cooperate to make it easier to get a job done.

______ 2. A cooperative is owned by the people who do business with it.

______ 3. A cooperative provides its members with goods and services on a non-profit basis.

______ 4. A cooperative is not democratically controlled by its members.

Cooperatives Key — What Have You Learned?

1. True
2. True
3. True
4. False: A cooperative's membership elects its board of directors on a one-man, one-vote basis.

Agribusiness
Unit 7

Ohio's Exports

Background – Ohio's Exports

Agriculture is Ohio's biggest business. Ohio farmers produce over 100 agricultural products, including products from both crops and livestock. If all of these agricultural products were listed, the list would be quite long. So let's look at 15 agricultural **commodities** that Ohio farmers produce. Remember, though, there are more than 90 other products that we are not looking at! Here are some of the things that Ohio farmers produce.

1. Corn
2. Swiss cheese
3. Tomatoes
4. Soybeans
5. Eggs
6. Potatoes
7. Cucumbers
8. Ice cream
9. Chicken
10. Wheat
11. Pork
12. Strawberries
13. Sweet corn
14. Cottage cheese
15. Turkey

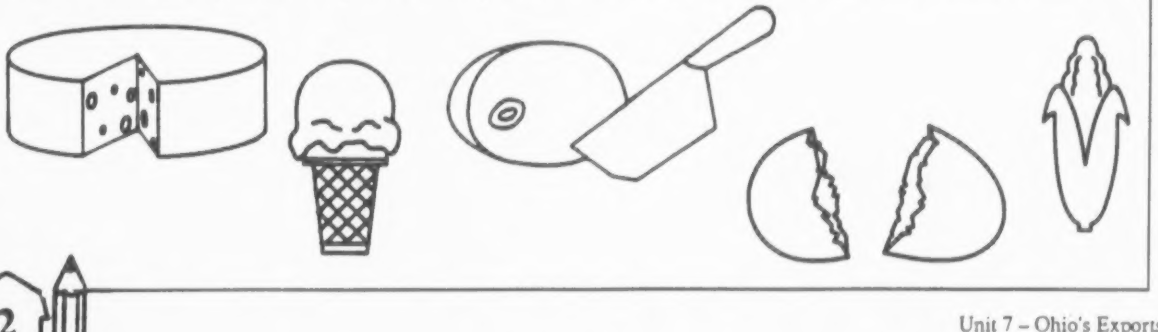
That is quite a long list already. How many of those products listed do you like to eat?

Ohio farmers are kept quite busy producing food so that you can eat some of the things you like. But, did you know that people in other parts of the United States and the world also eat food that Ohio farmers produce? In fact, Ohio farmers are such good producers of some of these products that the people in Ohio could not possibly eat all they grow.

Since we in Ohio cannot eat all of this food, Ohio farmers have to send some of these products out of the state or to other countries. These products are **exported**, which simply means that they are sent out of the state. So you see, people in other states and countries buy the things that Ohio farmers grow. By exporting these agricultural commodities, farmers in Ohio get money which allows them to stay in farming. This money also helps other people in Ohio. If farmers have more money to spend, then they can buy other things, so that shopkeepers, car dealers, barbers and movie house owners can stay in business too.

But where, exactly, do all of these agricultural products go? Where are the people who buy these Ohio agricultural products? Well, there are a number of places. If you look at the map, you can see some of the places where Ohio farmers send their products. Almost every state and over 20 countries buy products grown in Ohio. To get to some of these places, the products have to travel a long time over a great distance. For example, if Ohio potatoes are going to be sent to Los Angeles, California by truck, those potatoes would travel for 1,911 miles, which would take over 3 days! And if people in Japan were buying Ohio potatoes, those potatoes would have to travel over 6,519 miles. And, since the Pacific Ocean is between Ohio and Japan, some of this trip would have to be taken on a ship.

Yes, it takes a long time for Japanese children to finally get french fries that are produced in Ohio. It also costs money to send those french fries or any other agricultural commodity to other states or countries. The truck and the boat cost money to operate, so transportation becomes an added cost. The people who eat Ohio french fries or Ohio wheat in Japan, or Ohio potatoes in New York, have to pay more than you do for these goods since those french fries, potatoes, and wheat have to be carried such a long way. For example, a bushel of wheat sells for approximately $2.73 in Ohio. To get to London, England, this wheat has to first be carried to Toledo. The trip by truck would cost 42 cents a bushel. But the trip is not over. Once the wheat reaches Toledo, it has to be put on a ship to England. The trip by ship adds another 35 cents to the price of the bushel of wheat. So, the total trip for the bushel of wheat costs 77 cents –



that is 42 cents for the truck and 35 cents for the ship. The total cost at a port in England is then $3.50/bushel. That's quite a bit more than we pay in Ohio.

So, transportation increases the cost of Ohio products to consumers in other countries or states. But, people in other places are happy to pay this added cost to get Ohio products. Why are people in Los Angeles or England or any other place in the world willing to pay more than you do for Ohio agricultural products? Why don't they just grow potatoes or soybeans themselves?

Well, there are several possible reasons. First, Ohio farmers are good producers of some agricultural products. Many times, the farmers in Ohio can grow the product much cheaper than a farmer in Japan or California. So, even with the additional cost of transportation, soybeans grown in Ohio and transported to England may still be cheaper than soybeans the English can grow themselves. This leaves people in England and other places more time to produce products that they are good at making. If people in other places can buy Ohio products, they don't have to worry about producing them for themselves.

A second reason why people in other places might buy Ohio products is that they know they can get high quality. For example, Ohio soybeans are popular because of their protein level. People in Japan know that Ohio soybeans are good, so they may be willing to pay more in order to get our product.

Finally, other countries or states may not have the right climate or soil to grow some of the crops Ohio farmers grow. Maybe they just cannot produce potatoes or wheat at all. We certainly cannot grow all the things we eat in Ohio. For example, have you ever seen bananas growing in Ohio? No, because bananas need a much warmer climate than there is in Ohio. So we send potatoes, soybeans, and other agricultural products out of the state, as exports, but we have to buy bananas from other countries, like Honduras, Costa Rica, or Ecuador (see your map for the location of these countries) because these countries have a warm climate and grow bananas well. When we buy products from another country we call them **imports**.

So, you can see we cannot eat all that is produced in Ohio. Farmers have to send some of what they produce out of the state. This gives Ohio farmers more money and gives people in other states or countries the opportunity to eat agricultural goods grown in Ohio. But, we also have to buy things that cannot be grown here. Ohio **trades** with other states and countries so that people in each state and country have a greater variety of agricultural products available to eat. Ohio agricultural commodities have to travel long distances – and at a high cost – to get to other countries or states. And bananas have to travel a long distance to get to us. But, if we didn't export our crops, Japanese children would not be able to eat Ohio soybeans. If we in Ohio did not import certain foods, like bananas, pineapples, coffee or tea, we would not be able to enjoy these agricultural products here. So, through trading, everyone is better off, since everyone can eat a wider variety of foods!

Thanks to Bonnie Borris, Research Associate, Department of Agricultural Economics and Rural Sociology, University of Idaho, for developing the majority of this unit. *Also*, thanks to Heather Crombie, Trade Specialist, International Trade Division, Ohio Department of Development, for refiguring this unit for Ohio.

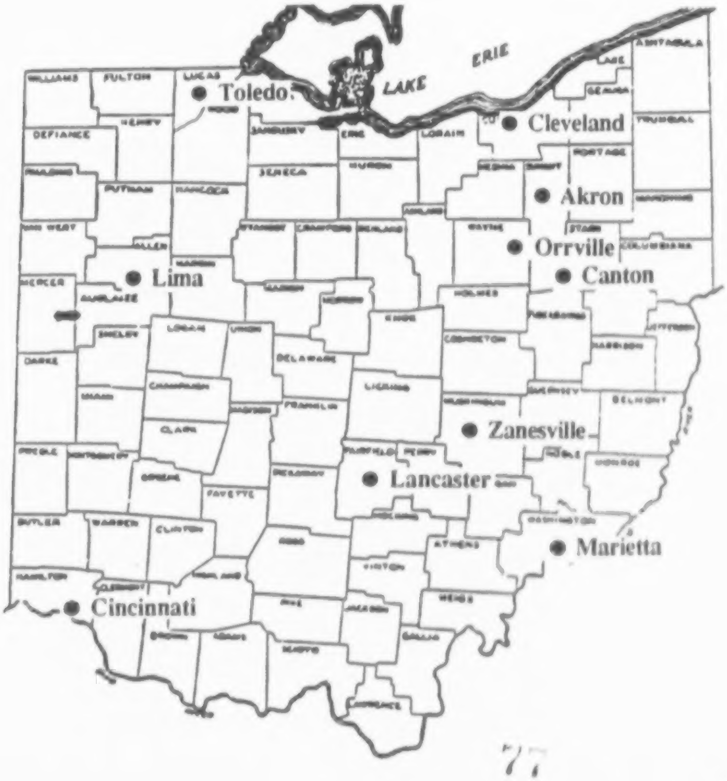
Support Information

The following is support information for the teacher to create his/her own worksheets for students to calculate the distances from towns in Ohio to trade countries. Use with Worksheets 1, 2, and 3 (pages 11-13).

1. The distances listed for road miles to Toledo or Cleveland from the various cities in Ohio have been taken from an Ohio road map. Distances have been rounded off to nearest tens.
2. Have students fill in the remainder of the graph using tables given on road maps or other classroom resources.

ROAD MILES

From	To Cleveland	to Toledo	To Cincinnati
1. Lima	150	80	
2. Canton	60		
3. Lancaster	150		130
4. Akron	40		
5. Marietta	170		
6. Orrville	40	190	
7. Zanesville	140		
8. Cincinnati	250	200	
9. *(your town)*			


LAKE
ERIE
Toledo
Cleveland
Akron
Orrville
Canton
Lima
Zanesville
Lancaster
Marietta
Cincinnati

Lesson: **Ohio's Exports**

Resources:

Map of the world, highlighting some of the countries where Ohio exports agricultural commodities and possible trade routes that Ohio exports take (pages 7 and 8). Trade game. Story on exports (pages 2-3). Map of world highlighting some of the countries from which Ohioans buy certain agricultural products. A reduced map that can be reproduced for students (page 9).

Premise:

Ohio agricultural products are consumed not only in Ohio, but in other parts of the United States and the world as well.

Objectives:

Students will understand the importance of Ohio agriculture to the state and the rest of the world. In particular, they will be able to:

1. Explain what an export is and give 10 examples of crops or livestock products that Ohio exports.
2. Name and identify on a map 10 places outside of the U.S. where Ohio exports agricultural commodities.
3. Explain why Ohio farmers export some products while we import others.
4. Explain why agricultural exports are important to both farmers and other members of the Ohio community.

Vocabulary:

1. Export – product sent out of the state or country
2. Import – a product brought into the state from other states or countries
3. Commodity – a basic agricultural product either from crops or livestock
4. Trade – to engage in the exchange, purchase, or sale of goods

Trivia:

1. Over half the world's total supply of corn is grown in the U.S.
2. Japan buys the most farm products from the U.S.
3. About 1/6 of what we eat comes from other countries.
4. The food we sell to other countries helps Americans pay for oil and goods we buy from other nations.

Ag Unit: **Ohio Ag Economics Core**
Major: **Mathematics**
Minor: **Social Studies**

Related Lesson Plan

Ohio's Largest Industry

Remarks/Notes

Suggested Activities

1. Have students complete 1 or all 3 of the worksheets - How Far Is It? (pages 11-13) The worksheets are designed to reinforce the concept of how far Ohio products travel when they are exported to other countries or states. The students will reinforce their skills when solving the distances products travel.

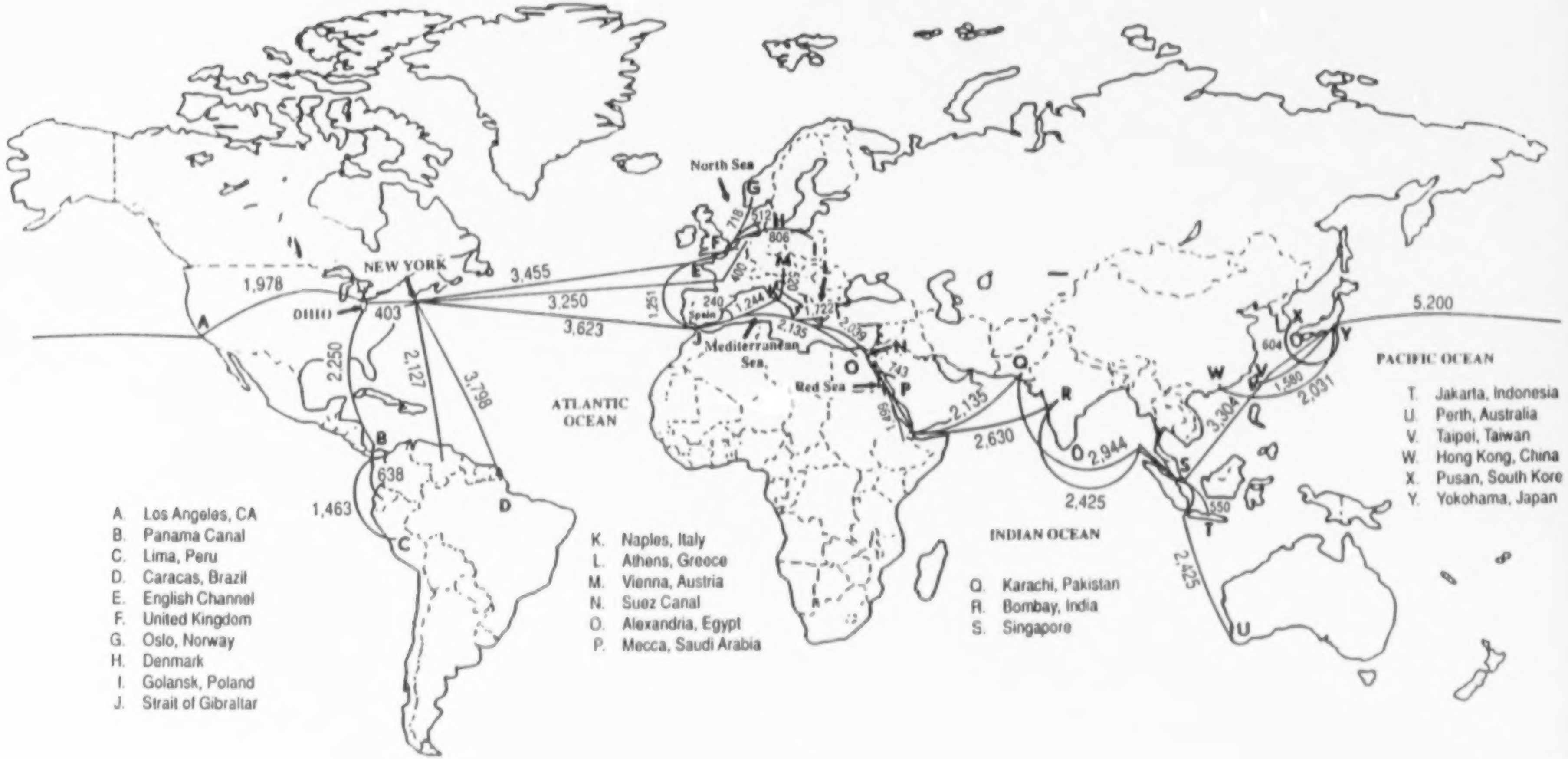
2. Worksheet 4 (page 14) – Summary Questions for Worksheets 1-3. These questions allow the students to go back to the data in Worksheets 1-3 and locate summary information.

3. Trade Game (pages 19-20) – An activity to allow students to demonstrate how our relationships with other countries affect our agriculture system.

4. Construct a bulletin board using a world map and picture of Ohio products. Arrange the Ohio products around the map of the world and place a piece of yarn (string) from the product to the places in the world where the products are exported.

5. Have students write a creative story on "The Ohio Soybean Who Went to Japan." You may want to add other products and destinations to give students more choices.

Ohio's Exports Trade Routes and Miles Traveled


North Sea
NEW YORK
OHIO
ATLANTIC OCEAN
Mediterranean Sea.
Spain
Red Sea
INDIAN OCEAN
PACIFIC OCEAN
1,978
403
3,455
3,250
3,623
2,250
2,127
3,798
638
1,463
718
512
806
400
520
1,251
240
1,244
1,722
2,135
2,039
743
1,469
2,135
2,630
2,944
2,425
2,425
550
3,304
1,580
2,031
604
5,200
A
B
C
D
E
F
G
H
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V
W
X
Y

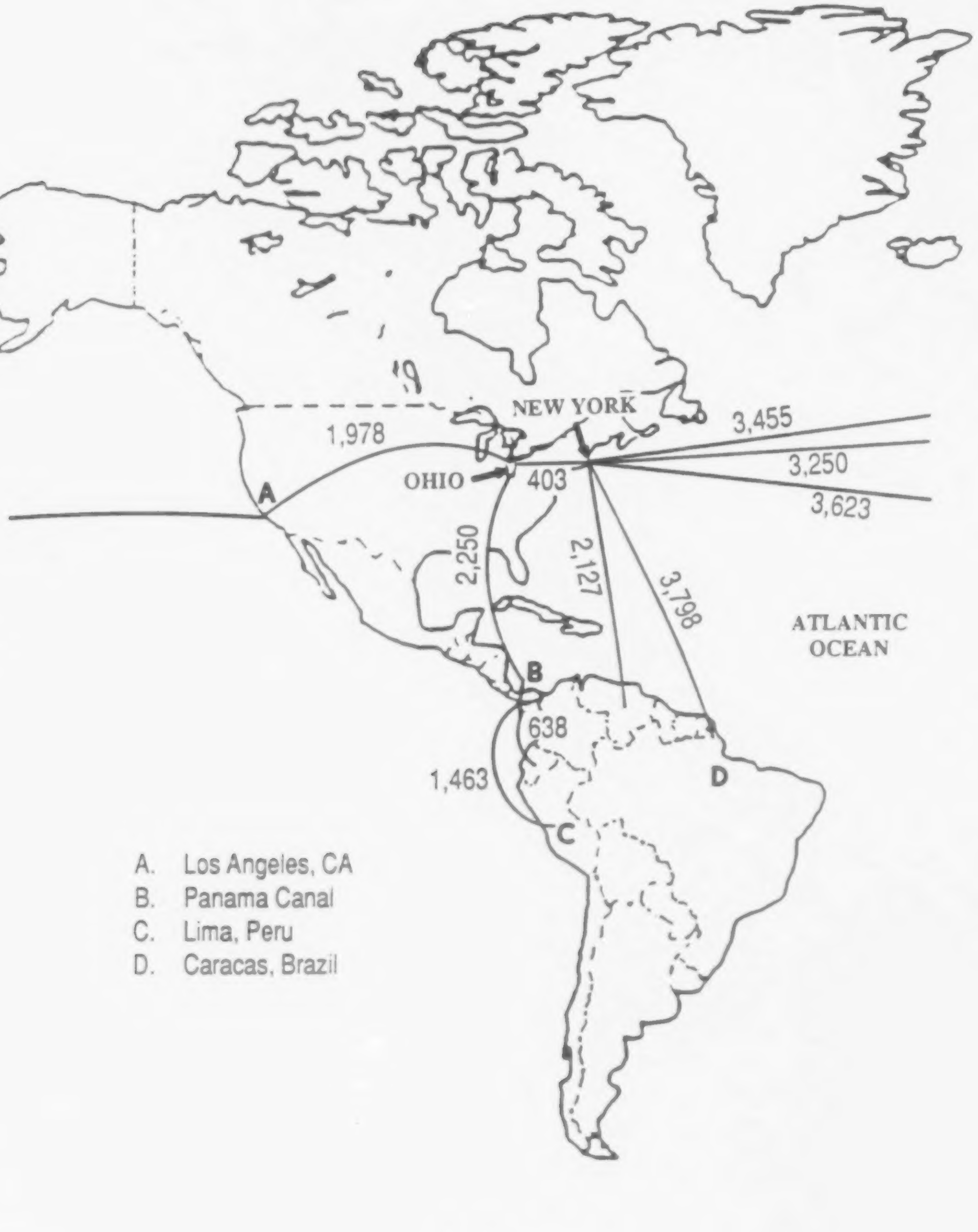
A. Los Angeles, CA
B. Panama Canal
C. Lima, Peru
D. Caracas, Brazil
E. English Channel
F. United Kingdom
G. Oslo, Norway
H. Denmark
I. Golansk, Poland
J. Strait of Gibraltar

K. Naples, Italy
L. Athens, Greece
M. Vienna, Austria
N. Suez Canal
O. Alexandria, Egypt
P. Mecca, Saudi Arabia

Q. Karachi, Pakistan
R. Bombay, India
S. Singapore

T. Jakarta, Indonesia
U. Perth, Australia
V. Taipei, Taiwan
W. Hong Kong, China
X. Pusan, South Kore
Y. Yokohama, Japan

Ohio's Exports Trade Routes


NEW YORK
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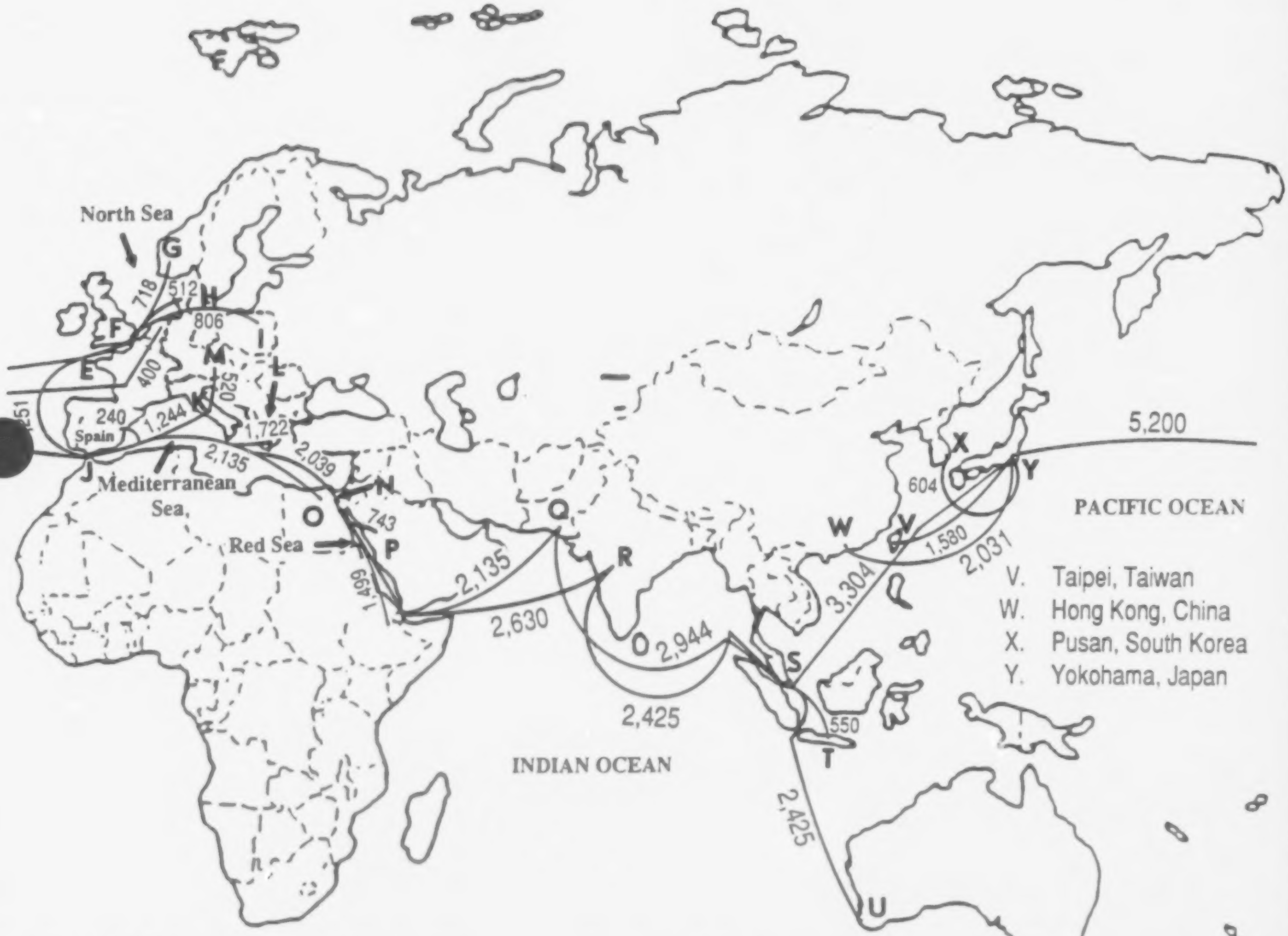
A. Los Angeles, CA
B. Panama Canal
C. Lima, Peru
D. Caracas, Brazil

and Miles Traveled


North Sea
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L
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240
1,244
K
Spain
1,722
J
2,135
2,039
Mediterranean Sea
N
O
743
Red Sea
P
1499
Q
2,135
R
2,630
O
2,944
2,425
S
550
T
INDIAN OCEAN
2,425
U
W
V
X
604
Y
5,200
PACIFIC OCEAN
1,580
2,031
3,304
V. Taipei, Taiwan
W. Hong Kong, China
X. Pusan, South Korea
Y. Yokohama, Japan

E. English Channel
F. United Kingdom
G. Oslo, Norway
H. Denmark
I. Golansk, Poland
J. Strait of Gibraltar

K. Naples, Italy
L. Athens, Greece
M. Vienna, Austria
N. Suez Canal
O. Alexandria, Egypt
P. Mecca, Saudi Arabia

Q. Karachi, Pakistan
R. Bombay, India
S. Singapore
T. Jakarta, Indonesia
U. Perth, Australia

Nautical Miles from Ohio to Ohio Trade Countries

PLACE			MILES
1.	Japan		
	through:	Los Angeles	1,978
	to:	Yokohama, Japan	5,200
	Total Miles		7,178
2.	Korea		
	through:	Yokohama, Japan	7,178
	to:	Pusan, South Korea	604
	Total Miles		7,782
3.	Hong Kong		
	through:	Yokohama, Japan	7,178
	to:	Hong Kong	2,031
	Total Miles		9,209
4.	Taiwan		
	through:	Yokohama, Japan	7,178
	to:	Taipei, Taiwan	1,580
	Total Miles		8,758
5.	Australia		
	through:	Singapore	10,482
	to:	Perth, Australia	2,425
	Total Miles		12,907
6.	Singapore		
	through:	Yokohama, Japan	7,178
	to:	Singapore	3,304
	Total Miles		10,482
7.	Indonesia		
	through:	Singapore	10,482
	to:	Jakarta, Indonesia	550
	Total Miles		11,032
8.	Italy		
	through:	Strait of Gibraltar	4,026
	to:	Naples, Italy	1,244
	Total Miles		5,270
9.	Greece		
	through:	Strait of Gibraltar*	4,026
	to:	Athens, Greece	1,722
	Total Miles		5,748

PLACE			MILES
10.	Saudi Arabia		
	through:	Strait of Gibraltar*	4,026
	through:	Suez Canal	2,039
	to:	Mecca, Saudi Arabia	743
	Total Miles		6,808
11.	Austria		
	through:	Strait of Gibraltar*	4,026
	through:	Naples, Italy	1,244
	to:	Vienna, Austria	520
	Total Miles		5,790
12.	Norway		
	through:	English Channel*	3,858
	to:	Oslo, Norway	718
	Total Miles		4,576
13.	Spain		
	through:	English Channel*	3,858
	to:	Denmark	513
	Total Miles		4,371
14.	Colombia		
	through:	English Channel*	3,858
	to:	Golansk, Poland	806
	Total Miles		4,664
15.	Egypt		
	through:	Strait of Gibraltar*	4,026
	to:	Alexandria, Egypt	2,135
	Total Miles		6,161
16.	India		
	through:	Suez Canal	6,065
	to:	Bombay, India	2,630
	Total Miles		8,695
17.	Peru		
	through:	Panama Canal	2,250
	to:	Lima, Peru	1,463
	Total Miles		3,713
18.	Brazil		
	to:	Caracas, Brazil*	4,201
19.	Pakistan		
	through:	Suez Canal	6,065
	to:	Karachi, Pakistan	2,135
	Total Miles		8,200

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*Add mileage from Cleveland to New York

Name ______________________________

Worksheet 1 – How Far Is It?

Agricultural commodities have to travel long distances to get from towns in Ohio to other countries. Since most of Ohio is **landlocked**, some of this distance has to be covered by land before the products can be sent across the ocean. In Ohio, the port we use most frequently is Toledo, Ohio. **Using the map**, calculate how many miles it is to each of the following countries from the city given. Note that in order to get to some of the countries, other distinctive countries or canals must be passed through. Also, list what method of transportation could have been used and what, if any, ocean was entered or crossed. (If no ocean was entered or crossed, put an "X.")

Example: *How many miles would a bushel of wheat have to travel from Mt. Vernon, Ohio, to get to Amsterdam, Netherlands?*

Place	Miles	Transportation	Ocean Entered or Crossed
Mt. Vernon to Toledo	80	truck	X
Toledo to the English Channel	3,745	ship	Atlantic
English Channel to Amsterdam, Netherlands	224	ship	North Sea
Total Miles	4,049		

Now, fill in the small charts for each of the questions below.

1. *How many miles would a bushel of corn have to travel from Lima, Ohio, to get to Calcutta, India?*

Place	Miles	Transportation	Ocean Entered or Crossed
Lima to Toledo			
Toledo to Singapore			
Singapore to Calcutta, India			
Total miles to India			

2. *How many miles would a ton of hardwood boards have to travel from Canton, Ohio, to get to Karachi, Pakistan?*

Place	Miles	Transportation	Ocean Entered or Crossed
Canton to Cleveland			
Cleveland to Singapore			
Singapore to Karachi, Pakistan			
Total miles to Pakistan			

Name ____________________

Worksheet 2 – How Far Is It?

1. How many miles would a bushel of wheat have to travel from Toledo, Ohio, to get to Lima, Peru?

Place	Miles	Transportation	Ocean Entered or Crossed
Toledo to Panama Canal			
Panama Canal to Lima			
Total miles to Peru			

2. *How many miles would a bushel of oats have to travel from Lancaster, Ohio, to get to Cabedelo, Brazil?*

Lancaster to Cincinnati			
Cincinnati to the Panama Canal			
Panama Canal to Quito, Ecuador			
Total miles to Ecuador			

3. *How many miles would a bushel of wheat have to travel from Akron, Ohio, to get to Barcelona, Spain?*

Akron to Cleveland			
Cleveland to Strait of Gibraltar			
Strait of Gibraltar to Barcelona, Spain			
Total miles to Spain			

4. *How many miles would a pound of beef have to travel from Marietta, Ohio, to get to Ras as Sidr, Egypt?*

Marietta to Cleveland			
Cleveland to Strait of Gibraltar			
Strait of Gibraltar to Ras as Sidr, Egypt			
Total miles to Egypt			

5. *How many miles would a pound of Swiss cheese have to travel from Orville, Ohio, to get to Amsterdam, Netherlands?*

Orville to Cleveland			
Cleveland to New York City			
New York to France			
France to Amsterdam, Netherlands			
Total miles to the Netherlands			

Name ____________________

Worksheet 3 – How Far Is It?

1. How many miles would a sack of potatoes have to travel from Cincinnati, Ohio, to get to Pusan, South Korea?

Place	Miles	Transportation	Ocean Entered or Crossed
Cincinnati to Los Angeles, CA			
Los Angeles to Japan			
Japan to Pusan, South Korea			
Total miles to South Korea			

2. How many miles would a ton of pork have to travel from Cincinnati, Ohio, to get to Barletta, Italy?

Cincinnati to New York			
New York to London, U.K.			
London to Strait of Gibraltar			
Strait of Gibraltar to Barletta, Italy			
Total miles to Italy			

3. How many miles would a pound of cheese have to travel from Orville, Ohio, to get to Taipei, Taiwan?

Orville to Los Angeles, CA			
Los Angeles to Japan			
Japan to Taipei, Taiwan			
Total miles to Taiwan			

4. How many miles would a bushel of wheat have to travel from Zanesville, Ohio, to get to Addis Ababa, Ethiopia?

Zanesville to Strait of Gibraltar			
Strait of Gibraltar to Suez Canal			
Suez Canal to Addis Ababa, Ethiopia			
Total miles to Ethiopia			

5. How many miles would a bushel of soybeans have to travel from Lima, Ohio, to get to Yokohama, Japan?

Lima to Los Angeles, CA			
Los Angeles to Yokohama, Japan			
Total miles to Japan			

Name ______________________________

Worksheet 4

Summary Questions for Worksheets 1 - 3

Now look at the worksheets and answer the following questions:

1. To which country do Ohio agricultural goods have to travel the farthest?

____

2. How far does the agricultural commodity have to travel to get to that country?

____

3. From your calculations, to which country do Ohio agricultural goods have to travel the least distance?

____

4. How many miles does the agricultural commodity have to travel?

____

5. To which country do Ohio agricultural products travel 7,992 miles?

____

6. To which country do Ohio agricultural products travel 7,744 miles? Do you know what continent this country is on?

____

7. List the countries that Ohio trades with that are reached by going through the Strait of Gibraltar.

a. ______________________________

b. ______________________________

c. ______________________________

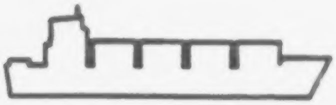
d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________



Ohio's Exports Key – Worksheet 1

1.	Lima to Toledo	80	truck	X
	Toledo to Singapore	10,482	ship	Pacific
	Singapore to Calcutta, India	2,425	ship	Indian
	Total miles to India	12,987		
2.	Canton to Cleveland	60	truck	X
	Cleveland to Singapore	10,482	ship	Pacific
	Singapore to Karachi, Pakistan	2,944	ship	Indian
	Total miles to Pakistan	13,486		

Ohio's Exports Key – Worksheet 2

1.	Toledo to Panama Canal	2,250	truck/ship	Gulf of Mexico
	Panama Canal to Lima, Peru	1,463	ship	Pacific
	Total miles to Peru	3,713		
2.	Lancaster to Cincinnati	130	truck	X
	Cincinnati to Panama Canal	2,250	barge/ship	Gulf of Mexico
	Panama Canal to Quito, Ecuador	638	ship	Pacifiic
	Total miles to Ecuador	3,018		
3.	Akron to Cleveland	40	truck	X
	Cleveland to the Strait of Gibraltar	4,026	ship	Atlantic
	Strait of Gibraltar to Barcelona, Spain	240	ship	Mediterranean Sea
	Total miles to Spain	4,306		
4.	Marietta to Cleveland	170	truck	X
	Cleveland to Strait of Gibraltar	4,026	ship	Atlantic
	Strait of Gibraltar to Ras as Sidr, Egypt	2,135	ship	Mediterranean Sea
	Total miles to Egypt	6,331		
5.	Orville to Cleveland	40	truck	X
	Cleveland to New York City	403	truck	X
	New York City to France	3,250	ship	Atlantic
	France to Amsterdam, Netherlands	400	ship/truck	Atlantic
	Total miles to the Netherlands	4,093		

Ohio's Exports Key – Worksheet 3

1.	Cincinnati to Los Angeles, CA	2,225	truck/train	X
	Los Angeles to Japan	5,200	ship	Pacific
	Japan to Pusan, South Korea	604	ship	Pacific
	Total miles to South Korea	8,032		
2.	Cincinnati to New York City	653	truck/train	X
	New York to London, U.K.	3,455	ship	Atlantic
	London to Strait of Gibraltar	1,251	ship	Atlantic
	Strait of Gibraltar to Barlette, Italy	1,277	ship	Mediterranean Sea
	Total miles to Italy	6,636		
3.	Orville to Los Angeles, CA	2,018	truck/train	X
	Los Angeles to Japan	5,200	ship	Pacific
	Japan to Taipei, Taiwan	1,580	ship	Pacific
	Total miles to Taiwan	8,798		
4.	Zanesville to Strait of Gibraltar	4,166	truck/ship	X
	Strait of Gibraltar to Suez Canal	2,039	ship	Mediterranean Sea
	Suez Canal to Addis Ababa, Ethiopia	499	ship	Red Sea
	Total miles to Ethiopia	6,704		
5.	Lima to Los Angeles, CA	2,128	truck/train	X
	Los Angeles to Yokohama, Japan	5,200	ship	Pacific
	Total miles to Japan	7,328		

Note: Addition not shown, but figured in each problem, is the mileage within Ohio to departure city of Cleveland. See page 4 for those mileages.

Ohio's Exports Key

Summary Questions for Worksheets 1-3

1. Pakistan
2. 13,486
3. Peru
4. 3,713
5. South Korea
6. Ethiopia – Africa
7. a. Spain
   b. Italy
   c. Greece
   d. Egypt
   e. Saudi Arabia
   f. Ethiopia
   g. Pakistan*
   h. India*

*Goods may also travel from the west coast through Singapore to reach this country.

Name ____________________

Ohio's Exports – What Have You Learned?

1. How is an import different from an export?

2 Why does Ohio import products?

3. What are 10 of Ohio's agricultural products?

4. Name 5 places in the United States where Ohio exports agricultural products.

5. Name and identify 5 countries, other than the United States, that we export agricultural products to:

6. Why do we export products?

7. What is a commodity?

8. How many agricultural products does Ohio grow?
   a. less than 20
   b. between 20 and 60
   c. over 60

9. Does Ohio grow bananas? Why?

10. Name 2 reasons why people in New York and even Japan are willing to pay more for Ohio commodities.

Ohio's Exports Key – What Have You Learned?

1. An import is traded into the state; an export is a product traded out of the state.
2. Ohio imports products because:
   a. Certain products need different climate and soil conditions.
   b. Certain products can be bought more cheaply than grown.
   c. It gives consumers a wider variety to choose from.
3. Corn
   Swiss cheese
   Tomatoes
   Soybeans
   Eggs
   Potatoes
   Cucumbers
   Ice cream
   Chicken
   Wheat
   Pork
   Strawberries
   Sweet corn
   Cottage cheese
   Turkey
4. Any state in the United States
5. Answers will vary; refer to map.
6. Ohio exports products because:
   a. Ohio produces excess foods and needs to sell them.
   b. Sales boost Ohio's economy.
7. A commodity is a basic agricultural product either from livestock or crops.
8. c. over 60 (actually over 100)
9. No, the climate is not right for growing bananas.
10. a. Higher quality product
    b. Cheaper to buy them than to grow the product themselves.
    c. People from New York or Japan may not have the proper climate and/or soil conditions to grow/raise the product themselves.

Trade Game

Title: Unequal resources

Premise: Interdependence with the world food and fiber system

Grade level: Fourth

Concepts to be taught: Scarcity, decision making

Core: Language Arts Creativity

Time frame: One class session

Objective: The students will demonstrate their understanding of how our relationships with other countries affect our agricultural system by engaging in a simulation involving the unequal distribution of natural resources creating the need for interdependent relationships between countries.

Vocabulary: Scarcity, trade, negotiate

Materials: To be divided into four large manilla envelopes:

4 task sheets, one for each of the 4 groups
4 large manilla envelopes
3 pairs of scissors
20 paper clips
1 ruler
1 bottle of glue
2 felt pens
2 pencils

colored paper (8½ " × 11 " sheets) (Note: Other colors may be substituted.)

2 sheets — red
5 sheets — white
3 sheets — blue
5 sheets — gold (4 " × 4 ")
3 sheets — green 2 of red
1 sheet — purple 2 of white

1 copy for each member of the 4 groups of the discussing questions (see handout enclosed)

Procedures: Fill the 4 large manilla envelopes as follows:

Envelope #1 — 2 scissors, 1 ruler, 20 paper clips, 2 pencils, 2 - 4 " squares of red paper and 2 - 4 " squares of white paper.

Envelope #2 — 1 pair scissors, 1 bottle of glue and 2 sheets of paper in each of the following colors: blue, white and gold.

Envelope #3 — 2 felt pens and 2 sheets of paper in each of the following colors: green, white and gold.

Envelope #4 — 1 sheet of paper in each of the following colors: green, gold, blue, red and purple.

1. Explain that the class will be divided into 4 groups, representing 4 different countries to be named by each group. List the countries on the board. Have each country select a leader.
2. Each leader will be given an envelope with all the natural resources in it that country has in order to meet the needs of its citizens. Do not allow them to open the envelope until told to do so.

3. Each country is to complete the task sheet in the envelope even though all the resources needed to do so won't be in the envelope. They must trade with each country in whatever way necessary to complete the task sheet. The first country to complete the task sheet is the winner.
4. Give the signal to begin.
5. Watch the "countries" as they complete their tasks. Make a few notes of comments the members of the countries make as they are trying to be productive and are trying to meet the wants and needs of the residents with scarce resources.
6. Post on the board the order in which each "country" completes its tasks.
7. Hand out the "Discussion Question Sheet" to each member of each group as they complete their tasks. Ask them to complete it.
8. When all groups have completed their tasks and their discussion question sheets, conduct a classroom discussion in which you mention which group finished first, why they did and how they did. Then continue your classroom discussion by reviewing each question. Elicit comments from each "country."

Adapted from "Teaching the Economics of the Food and Fiber System," Arkansas State Council on Economic Education.

Unequal Resources — Task Sheet

Your group is in the position of trying to provide certain needs and wants for your country. These needs and wants are met by completing the tasks listed below.

1. Food: Make four strips of gold paper each 3 inches by 1 inch.
2. Clothing: Make a green "T" 4 inches high.
3. Industry: Make a four-link paper chain, each link of a different color.
4. Shelter: Make a white square 2 inches to a side and attach a gold triangle to one side of the square.
5. Education: Make a four-page book out of two different colors. Remember that the book must have printing or pictures on each side.

Agribusiness
Unit 8

Nutrition

Background — Nutrition

Foods are divided into different groups according to their major nutritional contributions to diet. Eating for good **nutrition** is much like putting together a jigsaw puzzle. Each food or food group has different things you need. You have to put many different pieces together to get the whole nutrition picture. As a team, they include all the nutrients needed from a wide variety of foods. Each food group supplies at least one essential nutrient, but no one food provides all the nutrients in the amounts needed.

Many superstar athletes believe that certain foods at certain times will help them win. For example:

- Boxer Muhammed Ali used to eat a thick steak 6 hours before every fight.
- Football players Joe Namath and O. J. Simpson didn't eat anything on the day of a big game.
- Track athlete Mary Decker, a world-class half-mile runner by the age of 14, ate a huge plate of spaghetti 3 hours before a race.

Nutrition experts agree that athletes don't need to eat anything special. Like everyone else, they just need a good balanced diet and the right number of calories. Good nutrition and a balanced diet mean eating:

- Grains, especially whole grain foods.
- An **assortment** of fruits and vegetables.
- Milk or other dairy foods.
- Lean meats, poultry and fish.
- Not too many fats or fatty foods, sugar or heavily sweetened foods or salted foods.

The food groups include:

1. Meat Group

   Recommended servings — two daily.

   Important for protein, niacin, iron and thiamin (B1).

   Includes beef, pork, lamb, veal, poultry, eggs and fish. Other foods included in the meat group are legumes such as dry beans, lentils and peas, soy extenders and nuts which are often combined with animal protein.

2. Milk-Cheese Group

   Recommended servings are determined by age and sex: Children — 3 servings, teens — 4 servings, adults — 2 servings, pregnant women — 4 servings.

   Important for calcium, riboflavin and protein.

   Includes milk in any form: whole, skim, lowfat, evaporated, buttermilk, nonfat dry milk, yogurt, cheese, cottage cheese, ice cream and ice milk.

3. Vegetable-Fruit Group

   Recommended servings — four daily.

   Important for vitamins A and C and for fiber.

   Dark green, leafy or orange vegetables and fruit are recommended three to four times weekly for vitamin A.

   Citrus fruit is recommended daily for vitamin C.

4. Bread-Cereal Group

   Recommended servings — four daily.

   Important for thiamin (B1), iron, niacin and **carbohydrates**.

   Select only whole grain and enriched or fortified products.

   Includes all products made with whole grains or enriched flour or meal; breads, muffins, biscuits, pancakes, waffles, cooked or ready-to-eat cereals, cornmeal, grits, flour, spaghetti, macaroni, noodles, rice, barley and rolled oats.

5. Others Group

   Fats and sweets should be eaten in moderation. They provide few or no nutrients, only calories. Fats and sweets include margarine, mayonnaise, salad dressings, fats, candy, sugar, jams, syrups, soft drinks and other sweets. Also, included in this group are refined but unenriched breads, pastries and flour products. Nutritionists believe you will get enough fats and sugars if you eat a balanced diet from the other food groups.

Adapted with permission from "Agriculture in Iowa."

Lesson: **Nutrition**

Resources:

The Nutrient Route, Word Discovery, the Foodland Game, two plays, Classroom Sandwich Bake-off

Note: There is an excellent video for elementary students, "The Case of the Sneaky Snack" available through the Ohio AITC Office.

Premise:

Good nutrition leads to healthy bodies and a sense of well-being.

Objectives:

1. Students will learn that a variety of foods are needed for a healthy diet.
2. Students will learn about the four basic food groups.
3. Students will realize that fats and sweets should be eaten in moderation.

Motivation:

1. Where did the food you eat for breakfast originate?
2. Would your family have as many nutritious meals as they do now if they had to produce it all?
3. If you don't grow all your food, who does and where?
4. Have students write down a favorite food. Ask if they would like to eat this and nothing else for a week? What might happen? What might happen if they ate nothing else for a year? Would they be healthy?

Vocabulary:

1. Nutrition — way food is taken in and used by the body
2. Assortment — variety
3. Carbohydrates — sugars and starches

Trivia:

1. The sandwich was invented in England 200 years ago by the Earl of Sandwich, who was a gambler. He liked gambling so much that he would not take the time to sit down to meals. Since this meant he needed something he could eat without a knife or fork, he thought of putting a piece of meat between two slices of bread.

Ag Unit: **Food and Fiber**

Core

Major: **Health/Nutrition**

Minor: Science, Language Arts

Related Lesson Plans

Ag Media

Ohio's Largest Industry

Micronutrients

Sanitation, Labeling and Handling of Food

Remarks/Notes

3

Suggested Activities:

1. Using background information provided, discuss the four basic food groups. What foods are included under each of these groups?
2. Discuss the importance of reading labels. How can reading labels help prepare more nutritious, tasty, economical meals?
3. Ask students to bring in labels from prepared foods such as frozen dinners. What information must appear on the label? (All labels include the product name, net weight and ingredients listed in order by weight from largest to smallest. Many manufacturers also provide nutrition information on the label. All fortified foods, and all foods for which a nutritional claim is made, must also include nutrition information on the labels.)
4. Invite an Extension home economist or school lunch dietician to talk to your class about eating a balanced meal.
5. If possible, visit a home economics class at a local high school or the Cooperative Extension Service.
6. Make a collage from magazine pictures to represent the four basic food groups. Sponsor a contest with a reward for the best collage display in the classroom.
7. Divide the classroom into small groups and ask students to plan meals, using the four basic food groups for 1 week.
8. Ask students to bring in food nutrition labels from packaged food at home. Discuss what nutrients are listed on every label and what the USRDA (United States Recommended Daily Allowance) percentage means.
9. Experiment with foods to find out what will happen to them if not stored properly. Discuss the importance of proper food storage.
10. Have a classroom Sandwich Bake-off (page 7). Judge food based on nutrition, appearance and taste. Students must be able to tell origin of all ingredients.
11. Survey school lunch menus for 1 month. Record how many wheat, cattle, hog and poultry products are eaten in 1 day, 1 week or 1 month. Record how food fits into the food groups.
12. Make four headings on board or paper.
    - Bread/cereal
    - Meat
    - Fruit/Vegetables
    - Milk

    Under each heading list the nutrients they provide and reasons why they are important.
13. Make collages of magazine pictures showing a typical meal. Help students identify the main ingredients of each food and the farm product from which it is made. Discuss where the farm product is raised. Locate these areas on a map.
14. Organize a Dairy Fair and Tasting Party. Display as many dairy products as possible. Have enough available for sampling. Prepare dairy dishes for sampling and judging. Other possibilities may be Beef Fairs, Wheat Fairs, etc.
15. Have students take one food item and trace its processing steps from raw ingredients to the packaged food. (See Ohio's Largest Industry, page 3.)
16. Trace all the energy inputs necessary to produce, package, transport and sell one food product.
17. Have students plan school lunches. Make posters that would encourage students to eat lunches based on nutritional value.
18. Have students keep a food journal for a week, recording everything they eat. At the end of the week compare diets with recommended daily food group allotments. Did they have enough milk for the day? Enough green and yellow vegetables?
19. The Nutrient Route (page 9). Begin at the bottom and trace each picture to the top connecting products that contain the listed nutrients. You may want to check nutrition books or food labels for foods containing calcium, protein, vitamins A and C and carbohydrates. Beginning at the bottom of the chart and moving upward, connect foods that contain common nutrients. An answer key is found on page 13.
20. Plays "The Good Guys" and "Glass of Milk" (pages 5 and 6). Have the students act out the plays.
21. Word discovery and maze (page 12).
22. The Foodland Game (pages 10 and 11). Directions are on the game card.

The Good Guys

Ham Burger: Hello there boys and girls! I'm Mr. Ham Burger, your favorite food. Isn't it great I'm also good for you.

Milk: Just a minute there, Mr. Burger. Boys and girls like me too, and I bet I'm more nutritious than you.

Ham Burger: Really — let's compare. Did you ever hear of the Four Basic Food Groups? I'm part of the Meat Group. Everyone needs a meat protein daily. Of course I think I'm best but there is also pork, poultry, eggs, cheese and nuts, especially peanut butter, in here with me.

Ham Burger: You should have two servings from my group daily. We are the building blocks of every cell in the body. We fight infection and disease, and we build the muscles to hold your bones together. I'm also an important source of iron, niacin and thiamin.

Milk: Well, I guess you are nutritious, but I'm nature's almost perfect food. Babies start their life with me. All kinds of "yummy" foods are made with me — ice cream (you like that don't you?), cheese, milkshakes and so many things.

I want to tell the boys and girls why they should have three servings from my food group each day. I also provide protein but even more important I provide calcium for strong bones and teeth. Calcium also helps your heart, muscles and nerves work. Mr. Burger, you didn't mention fat. Bet you thought that was a bad word; well, it's not. Everyone needs some fat for energy and to carry vitamins throughout your body. I also have vitamins A and D.

Carrot: Really, you guys be quiet for awhile. I admit you're pretty important, but just wait until I tell them about me. We have heard you children complain about not wanting to eat spinach, peas, carrots, etc., but there are so many of us you can have a variety. Everyone should have some dark green vegetables several times a week and some yellow vegetables three to four times weekly. Children, how about helping me with a list of the yellow and green vegetables:

Yellow		Green	
carrots	sweet potatoes	peas	beans
squash		spinach	broccoli

You need vegetables for vitamins A and C, also bulk.

Apple: I thought I was a part of this food group, and you haven't even let me say a word.

Carrot: Okay, we'll let you have your say now.

Apple: Thank you. I've been listening to all of you tell why you're so great, and I admit you are real good, but so am I. There are so many of us and we are all so pretty — like me — the purple grapes, cherries, peaches, bananas, oranges, watermelon and much, much more. Do you know how much fruit you should have daily? (Ask children.) Do you need one or two servings daily for vitamin C in the body?

Carrot: Well, Fruity, we do go well together don't we! We help fight infection, strengthen blood vessels and promote healthy eyes.

Bread: Hi there, boys and girls. I'm the grain group and I've been setting here being very patient, but it's about time I jumped up and said my piece. After all, I'm needed too, and there's a variety of us also. I'm not just bread you know.

Carrot: Well name them for us.

Bread: I forgot, maybe the children can help: Cereal, bread, crackers, noodles, macaroni, etc. That's right, I didn't forget. I just wanted the children to have a chance to talk.

Carrot: Oh! Grainy, you always do things differently. Now tell us what's so good about you.

Bread: I supply energy which gives you pep to work and play. You also get the B vitamins which help your nervous system and assure good digestion.

Then, I'm a very important source of fiber, and you know what that does don't you — keeps your intestines healthy.

All: We certainly have been bragging. We are all important.

Ham Burger: I'll have to admit there is more to life than a hamburger!

All: That's right. The solution is to eat a variety of foods everyday.

Glass of Milk

Hello, boys and girls. You know me don't you? Of course, I'm a glass of milk.

Did you have milk for breakfast today? Each of you should have three servings of foods from the milk group per day. Part of that may be cheese, ice cream or any other food made with milk.

Today, I would like to tell you about me, why I'm good for you and how I came to be.

Milk comes from cows. Dairy farmers raise special kinds of cows that produce millions and millions of pounds of milk for you to drink each year. Some of these special cows are called Holsteins, Jerseys and Guernseys.

The dairy cow is taken care of very well. She has a good place to "loaf," that is eat, drink, rest and produce milk. She is given hay, grain, special protein, minerals and salt, and whenever possible lots of green grass. The cow also needs plenty of fresh, clean water to drink — about 30 gallons per day.

The cow is milked every morning and every evening by milking machines in milking parlors. These parlors are very, very clean so that you get only the very best milk. The cow is thoroughly washed before each milking.

Government inspectors visit the dairy farm regularly to make certain you receive only good, clean milk.

As I said the milking is done by machines, but the farmer must put these machines on the cows. The milk is then run into large tanks where it is cooled and later picked up by shiny tank trucks and taken to dairy processing plants where it is processed and packaged for stores or made into other products.

I have talked a lot; how about helping me. Can you tell me four foods made of milk? (Milk, buttermilk, cheese and ice cream and yogurt.)

Great; now can we think of at least five foods that include milk or milk products? (Creamed vegetables, soups, puddings, macaroni and cheese and many more.)

Now, I think it's time to tell you why I'm good for you. You will notice I and the foods you just mentioned are from the milk group.

Milk provides protein, calcium and vitamins. Protein helps you grow, builds and maintains body cells and helps increase resistance to infection.

Calcium gives structure and strength to bones and teeth.

I also provide vitamin A and the B vitamins naturally. Vitamin D is added to the milk you buy.

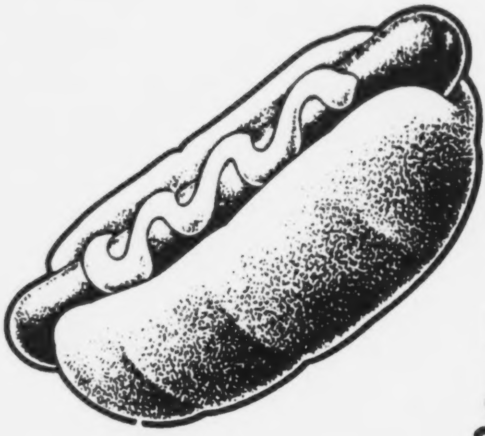
Vitamin A is best known for healthy eye tissue. The B vitamins also promote growth, healthy skin and eyes. Vitamin D is needed to help other vitamins and minerals work.

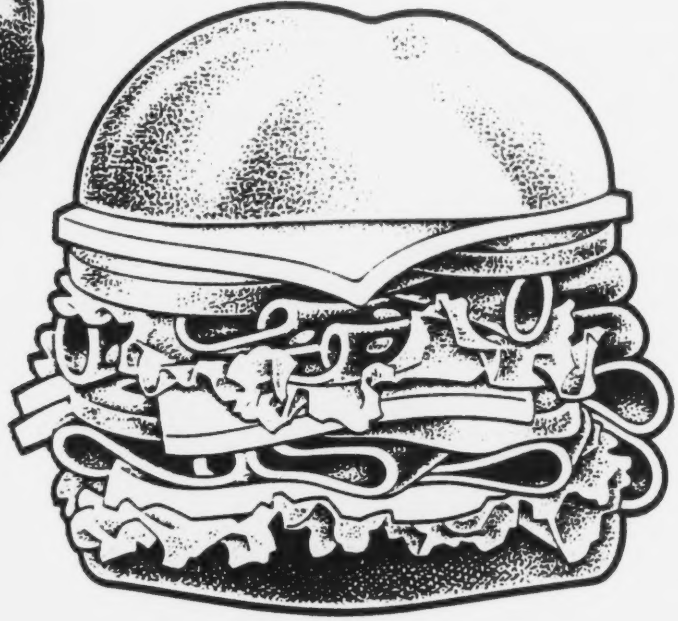
And the next time you want a cool drink — make it milk.

Adapted with permission from "Farming in the Classroom," Indiana Farm Bureau.

Classroom Sandwich Bake-Off

1. Ask each student to bring sandwich ingredients to school for a classroom bake-off.
2. Have two loaves of bread available, or a variety of different breads.
3. Each student may make an open-face sandwich using no more than three ingredients.
4. Display the sandwiches.
5. Divide students into groups to judge the sandwiches.
6. Students judge the sandwiches according to appearance and nutrition and record scores on scorecards provided on the next page.
7. Students may then sample the sandwiches for taste and record their scores on the scorecards.
8. Teacher and students then tally scores and declare winners in each group.





Sandwich Bake-off Scorecard

Sandwich Name ______________________________

Appearance score:
- Excellent — 4 points
- Good — 3 points
- Fair — 2 points
- Poor — 1 point

Nutrition (how many food groups are represented):
- 3 groups — 3 points
- 2 groups — 2 points
- 1 group — 1 point

Do not give credit to ingredients from the Fat/Sweet Group

Taste score:
- Excellent — 4 points
- Good — 3 points
- Fair — 2 points
- Poor — 1 point

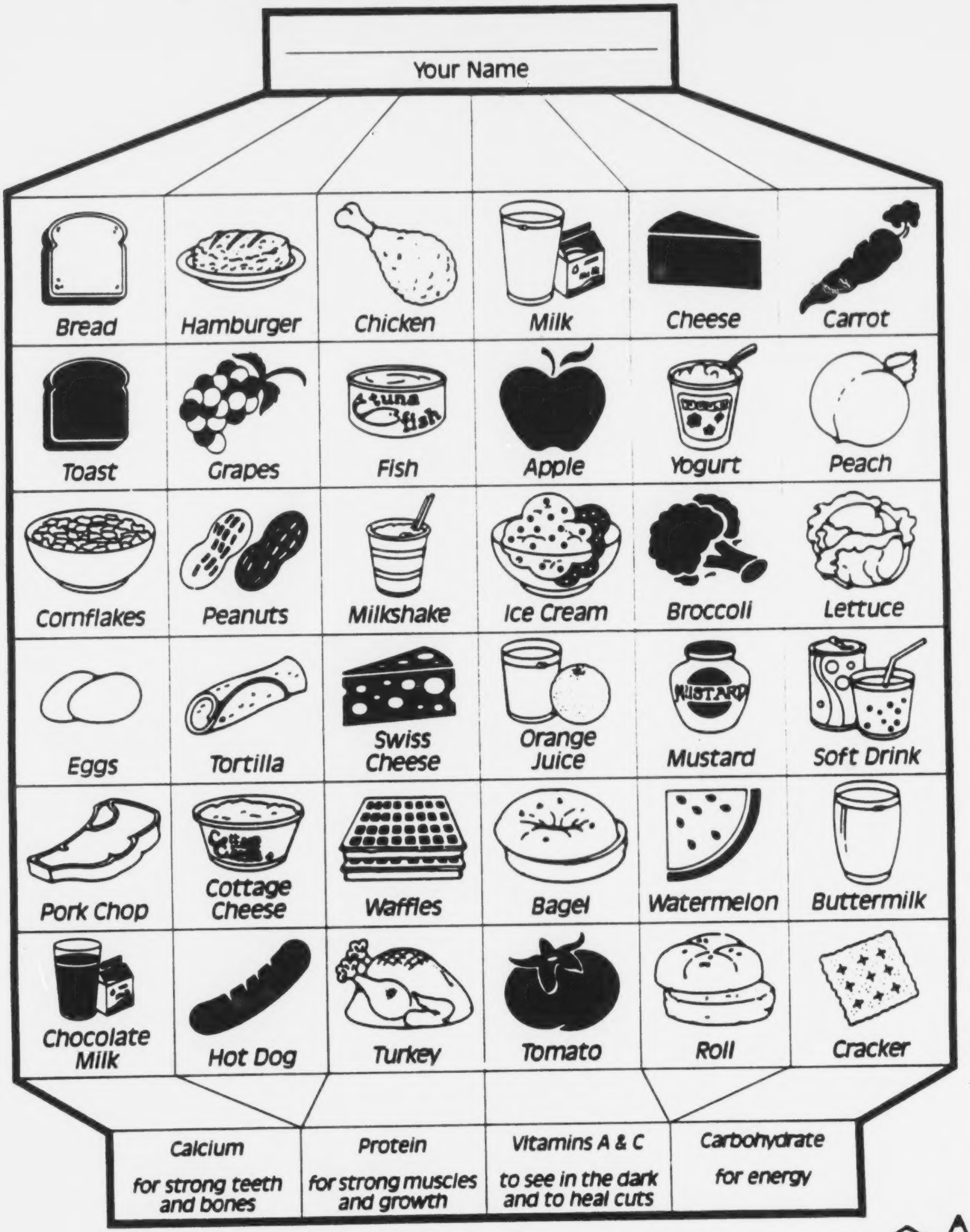
Total points ____________________

Note to teacher: The score sheet below will serve to score all the sandwiches in your class. You could put the possible points for the appearance, nutrition and taste divisions on the chalkboard.

Sandwich Bake-off Score Sheet

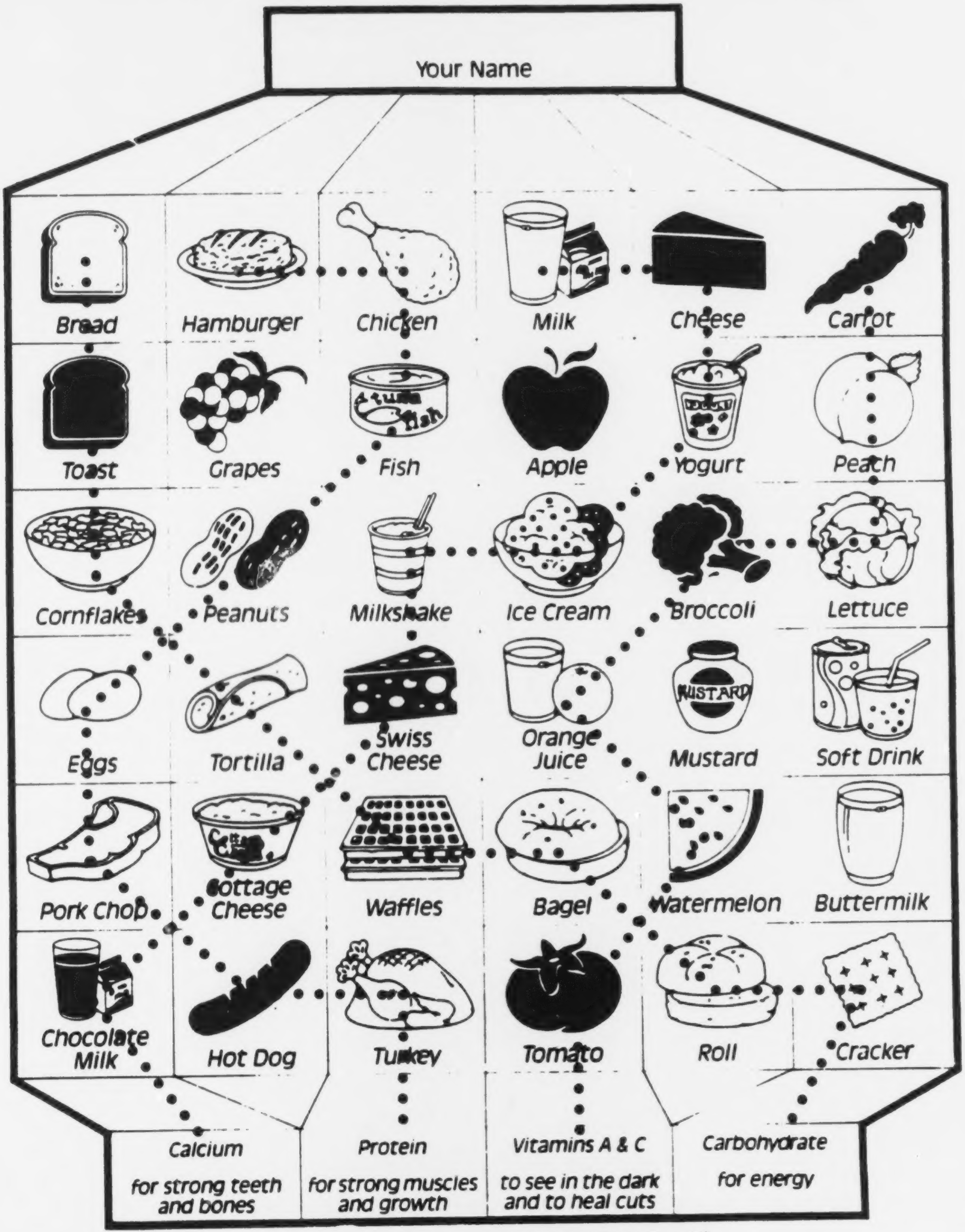
Sandwich Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Appearance																														
Nutrition																														
Taste																														
Total																														

The Nutrient Route


Your Name
Bread
Hamburger
Chicken
Milk
Cheese
Carrot
Toast
Grapes
Fish
Apple
Yogurt
Peach
Cornflakes
Peanuts
Milkshake
Ice Cream
Broccoli
Lettuce
Eggs
Tortilla
Swiss Cheese
Orange Juice
Mustard
Soft Drink
Pork Chop
Cottage Cheese
Waffles
Bagel
Watermelon
Buttermilk
Chocolate Milk
Hot Dog
Turkey
Tomato
Roll
Cracker
Calcium
for strong teeth and bones
Protein
for strong muscles and growth
Vitamins A & C
to see in the dark and to heal cuts
Carbohydrate
for energy

Note: Directions are found on page 4 item number 19.

The Nutrient Route Key

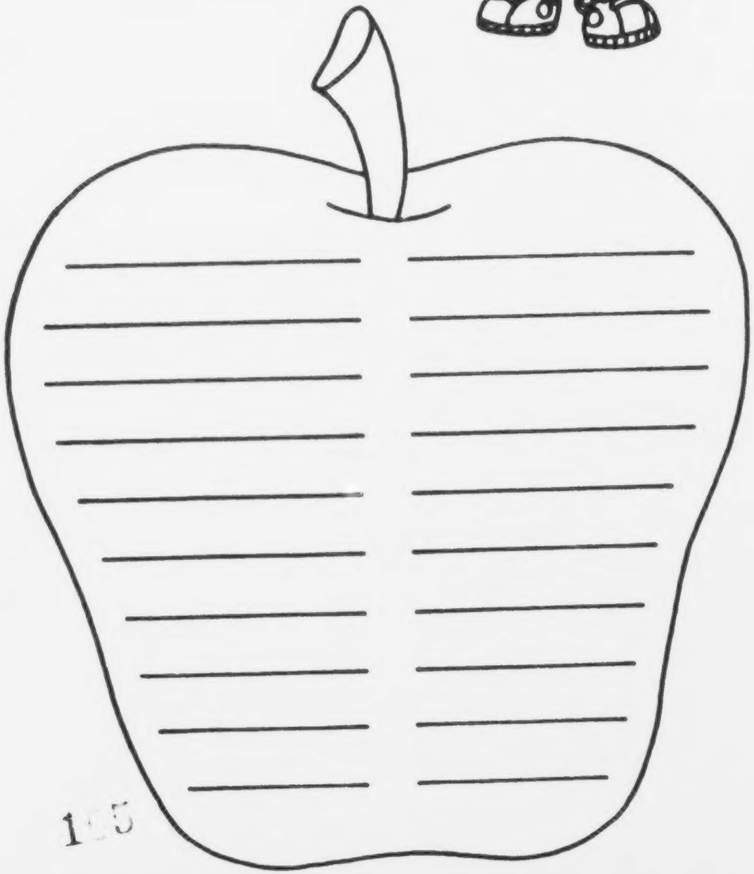

Your Name
Bread
Hamburger
Chicken
Milk
Cheese
Carrot
Toast
Grapes
Fish
Apple
Yogurt
Peach
Cornflakes
Peanuts
Milkshake
Ice Cream
Broccoli
Lettuce
Eggs
Tortilla
Swiss Cheese
Orange Juice
Mustard
Soft Drink
Pork Chop
Cottage Cheese
Waffles
Bagel
Watermelon
Buttermilk
Chocolate Milk
Hot Dog
Turkey
Tomato
Roll
Cracker
Calcium
for strong teeth and bones
Protein
for strong muscles and growth
Vitamins A & C
to see in the dark and to heal cuts
Carbohydrate
for energy

Food. . . Your Choice™. Courtesy of National Dairy Council®

WORD DISCOVERY

How many words
can you make from
the word -

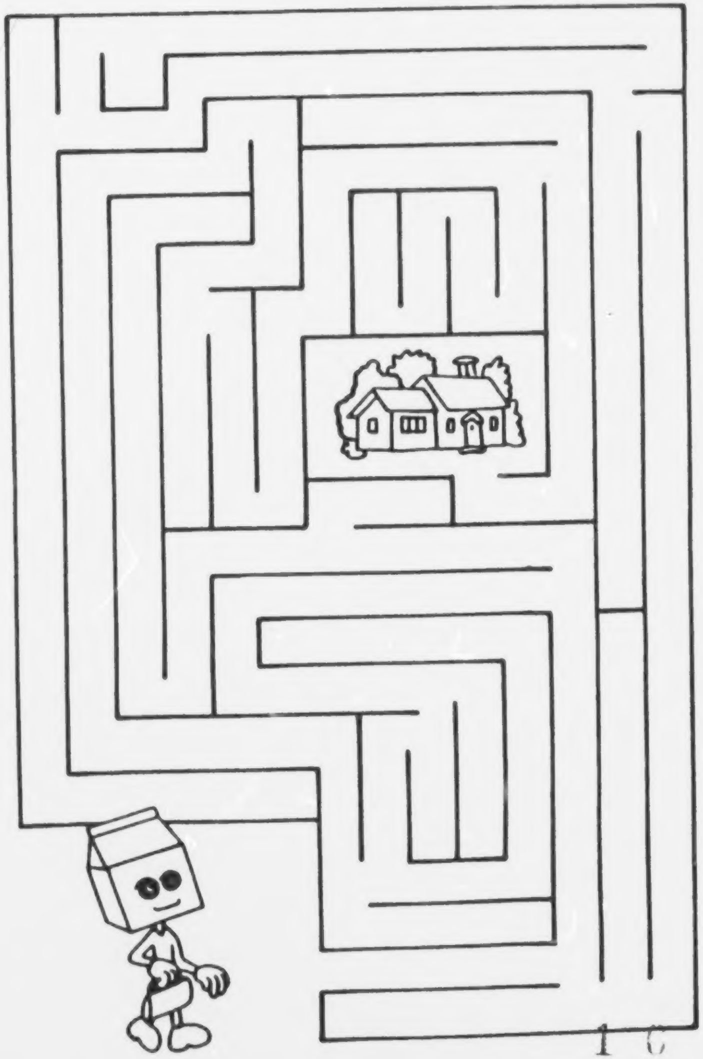
NUTRITION



Name ____________________

MAZE

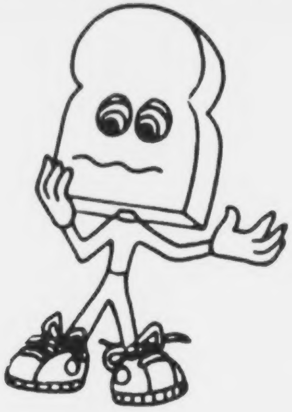
Can you get Molly Milk home?

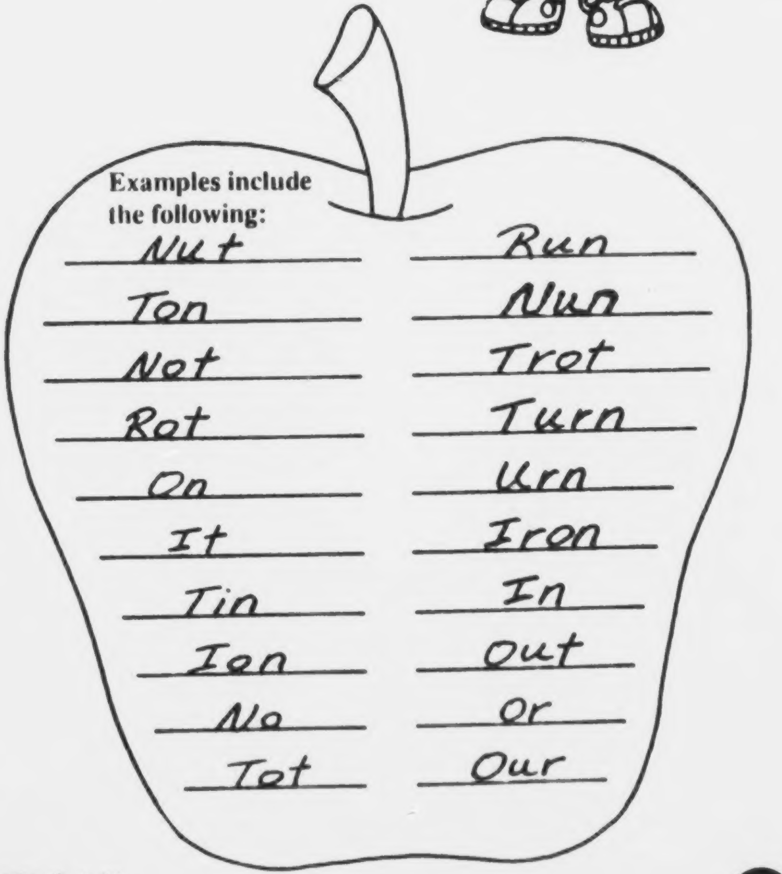


Word Discovery and Maze Keys

WORD DISCOVERY

How many words
can you make from
the word -
NUTRITION





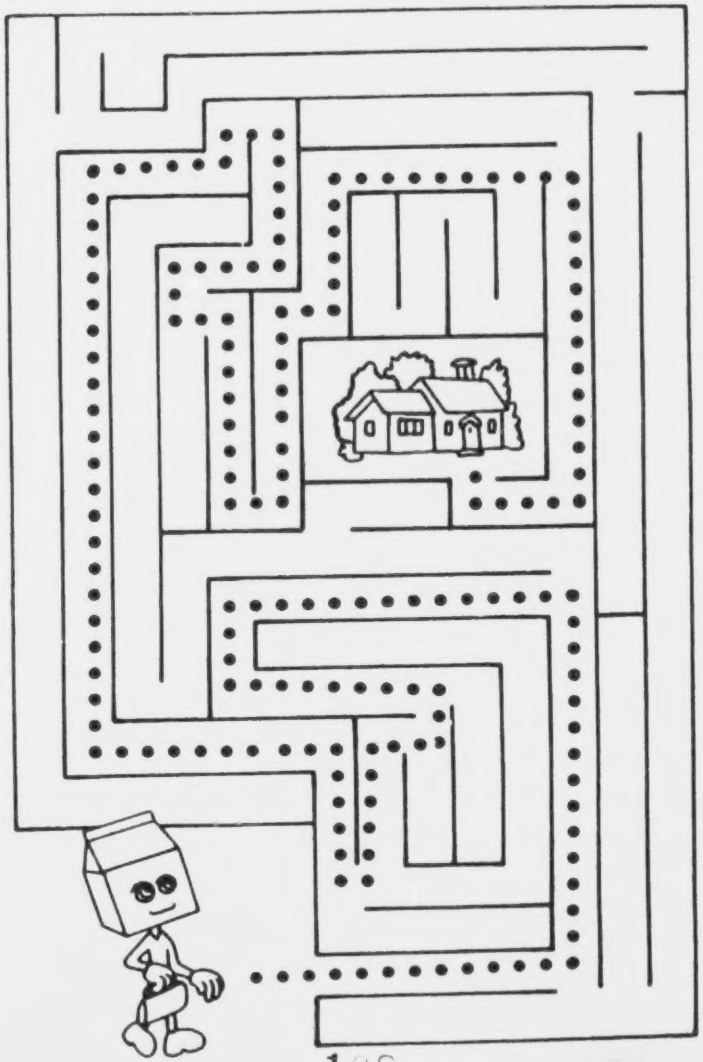
Examples include the following:

Nut
Ton
Not
Rot
On
It
Tin
Ion
No
Tot

Run
Nun
Trot
Turn
Urn
Iron
In
Out
Or
Our

MAZE

Can you get Molly Milk home?



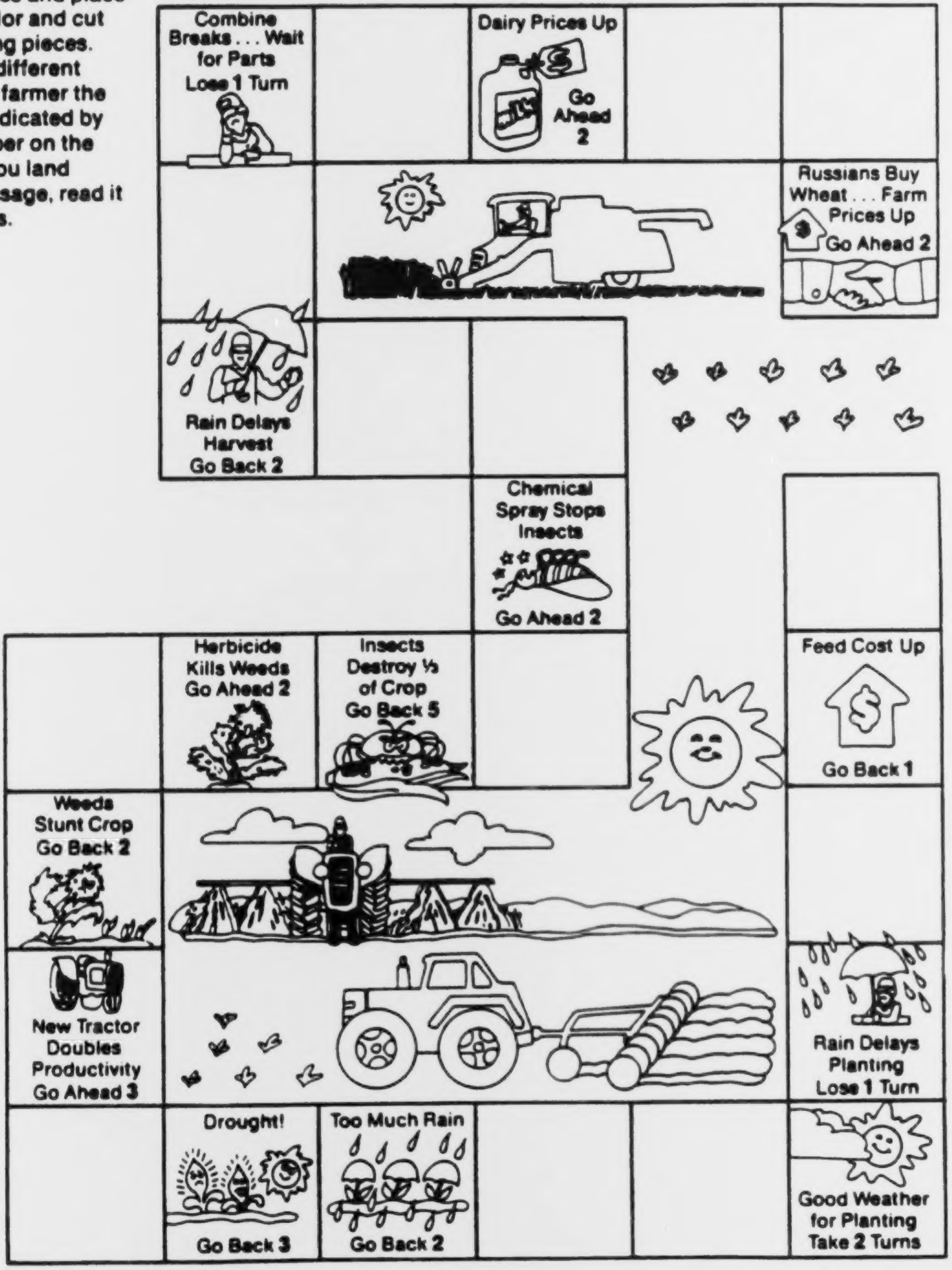
Name ____________________

Nutrition — What Have You Learned?

1. Plan a nutritious daily menu. Include a breakfast, lunch and dinner. Make sure your menus include a variety of foods from the groups.

THE FOODLAND GAME

Directions: Use dice or cut out the numbered squares and place them face down. Color and cut out the farmer playing pieces. Each player takes a different color. Advance your farmer the number of spaces indicated by the dice or the number on the square you pick. If you land where there is a message, read it and follow directions.


Combine Breaks . . . Wait for Parts Lose 1 Turn
Dairy Prices Up Go Ahead 2
Russians Buy Wheat . . . Farm Prices Up Go Ahead 2
Rain Delays Harvest Go Back 2
Chemical Spray Stops Insects Go Ahead 2
Herbicide Kills Weeds Go Ahead 2
Insects Destroy ⅓ of Crop Go Back 5
Feed Cost Up Go Back 1
Weeds Stunt Crop Go Back 2
New Tractor Doubles Productivity Go Ahead 3
Rain Delays Planting Lose 1 Turn
Drought! Go Back 3
Too Much Rain Go Back 2
Good Weather for Planting Take 2 Turns

1

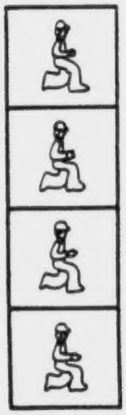
2

3

4

5

6



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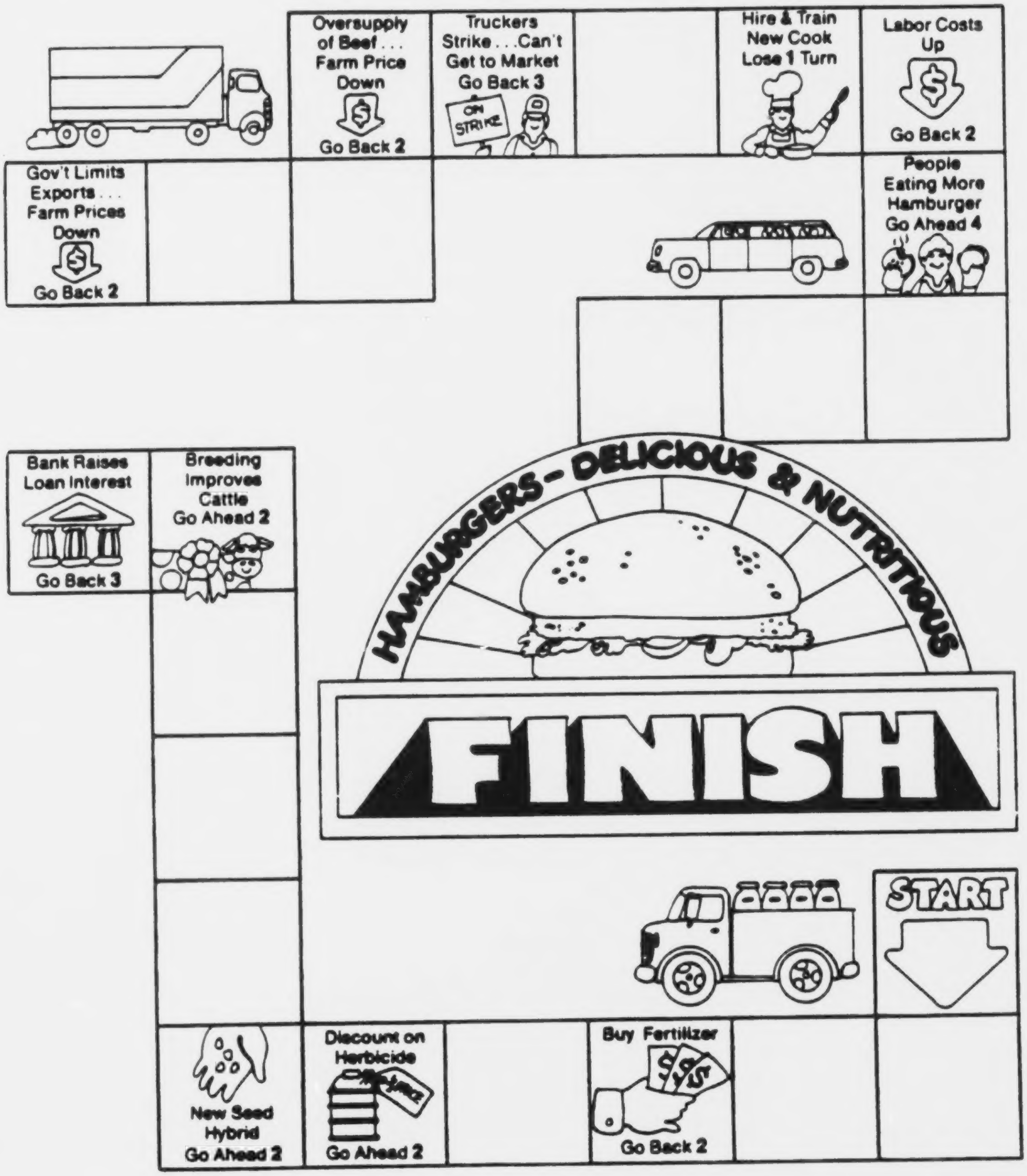
Some farmers say agriculture is like a game of chance. Play this game and try your "luck" in agriculture. See if you can make it to the hamburger stand first.


START
People Eating More Hamburger Go Ahead 4
Labor Costs Up Go Back 2
Hire & Train New Cook Lose 1 Turn
Truckers Strike . . . Can't Get to Market Go Back 3
ON STRIKE
Oversupply of Beef . . . Farm Price Down Go Back 2
Gov't Limits Exports . . . Farm Prices Down Go Back 2
Bank Raises Loan Interest Go Back 3
Breeding Improves Cattle Go Ahead 2
New Seed Hybrid Go Ahead 2
Discount on Herbicide Go Ahead 2
Buy Fertilizer Go Back 2
HAMBURGERS – DELICIOUS & NUTRITIOUS
FINISH

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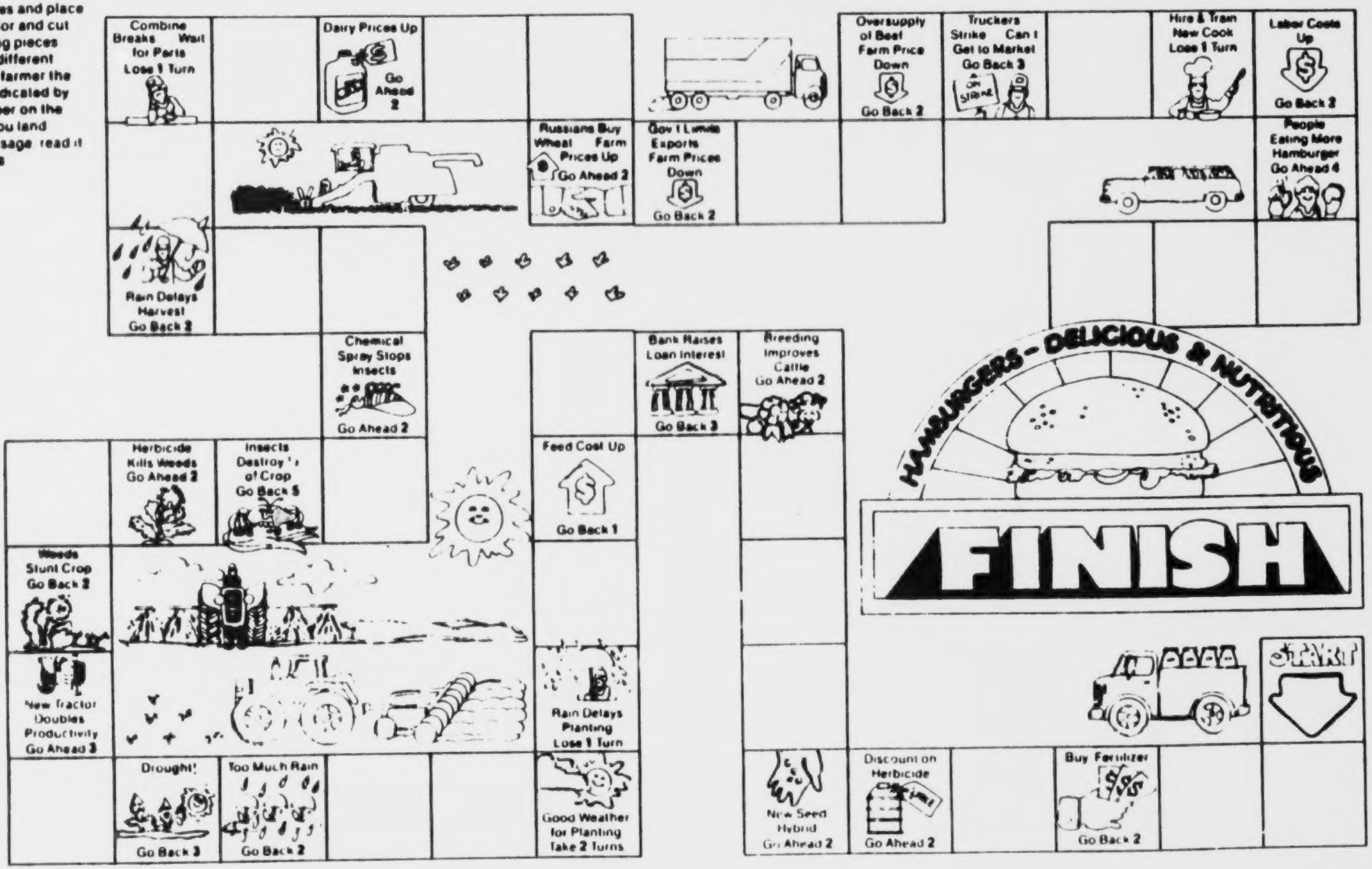
THE FOODLAND GAME

Some farmers say agriculture is like a game of chance. Play this game and try your "luck" in agriculture. See if you can make it to the hamburger stand first.

Directions: Use dice or cut out the numbered squares and place them face down. Color and cut out the farmer playing pieces. Each player takes a different color. Advance your farmer the number of spaces indicated by the dice or the number on the square you pick. If you land where there is a message, read it and follow directions.


Combine Breaks Wait for Parts Lose 1 Turn
Dairy Prices Up Go Ahead 2
Oversupply of Beef Farm Price Down Go Back 2
Truckers Strike Can't Get to Market Go Back 3
ON STRIKE
Hire & Train New Cook Lose 1 Turn
Labor Costs Up Go Back 2
Russians Buy Wheat Farm Prices Up Go Ahead 2
USSR
Gov't Limits Exports Farm Prices Down Go Back 2
People Eating More Hamburger Go Ahead 4
Rain Delays Harvest Go Back 2
HAMBURGERS – DELICIOUS & NUTRITIOUS
Chemical Spray Stops Insects Go Ahead 2
Bank Raises Loan Interest Go Back 3
Breeding Improves Cattle Go Ahead 2
Herbicide Kills Weeds Go Ahead 2
Insects Destroy ½ of Crop Go Back 5
Feed Cost Up Go Back 1
FINISH
Weeds Stunt Crop Go Back 2
New Tractor Doubles Productivity Go Ahead 3
Rain Delays Planting Lose 1 Turn
START
Drought! Go Back 3
Too Much Rain Go Back 2
Good Weather for Planting Take 2 Turns
New Seed Hybrid Go Ahead 2
Discount on Herbicide Go Ahead 2
SALE
Buy Fertilizer Go Back 2
$$$

1

2

3

4

5

6

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Agribusiness
Unit 9

Sanitation, Labeling, and Handling of Food

Background — Sanitation, Labeling and Handling of Foods

Labels on food packages are "shopper helpers" that tell a story to the consumer. A label tells the name of the food, the weight of the contents, what the product contains and the name and address of the manufacturer, packer or distributor.

Ingredients on the package are listed, with the largest amount first and the least listed last. Colorings and additives are also listed with a brief explanation of what these additives do. The Universal Product Code label (U.P.C.) tells the grocery scanner the cost of the product and the product name. These are the black and white lines found on packages.

Sometimes if ingredients are listed, all must be listed to follow a general recipe. This is called "Standards of Identity" established by the U.S. Government. For example, "Beef with Gravy" must be at least 50 percent beef but if the label says "Gravy with Beef," then it must have 35 percent beef.

Nutrition labeling is another important item on a label. Anything that claims it will do something special for your health must have a nutrition label.

The month, day and year are stamped on the top or bottom of some packages. This means the contents will be freshest if used by that date. "Pull by . . ." means it can't be sold after a certain date and "Exp." means not to use the product after that date.

Proper sanitation and care in handling food is also important to our health. Microbiological contamination is by far the greatest risk to a safe food supply. However, consumers are much more concerned about additives and environmental pollutants or contaminants than they used to be. Food producers, food service personnel and food industry "workers" must take great care in handling, processing and storage of foods to ensure maximum safety to the consumer.

Safety tips in handling and storage of food:

1. Be sure you know how the food you eat has been stored and prepared. Food can be spoiled even though it doesn't smell spoiled or look like it.
2. Eat only fresh or properly cooked foods.
3. Practice proper sanitation procedures regarding utensils and kitchen counters.
4. Keep hot foods at 140°F and cold foods below 45°F.

Lesson: **Sanitation, Labeling and Handling of Food**

Ag Unit: **Food and Fiber**
Core
Major: **Health and Nutrition**
Minor: **Social Studies**

Related Lesson Plans

Ag Media
Micronutrients
Nutrition

Remarks/Notes

Resources:

Assorted labels

Premise:

Labels tell a story to the consumer. Great care must be taken in practicing proper sanitation, handling and storage of foods.

Objectives:

1. Students will learn proper care and handling of foods.
2. Students will learn to examine various food packaging labels.

Specific things to look for:

1. Labels tell a story to the consumer.
2. Observe proper care and handling of food.

Vocabulary:

1. Microorganisms — tiny living things much too small to see
2. Sanitation — cleanliness
3. Label — information on a container telling the contents of that container
4. Contamination — presence of dirt or other unclean particles in food
5. Environment — space and those things around you
6. Microbiological — describing a situation dealing with microscopic forms of life

Trivia:

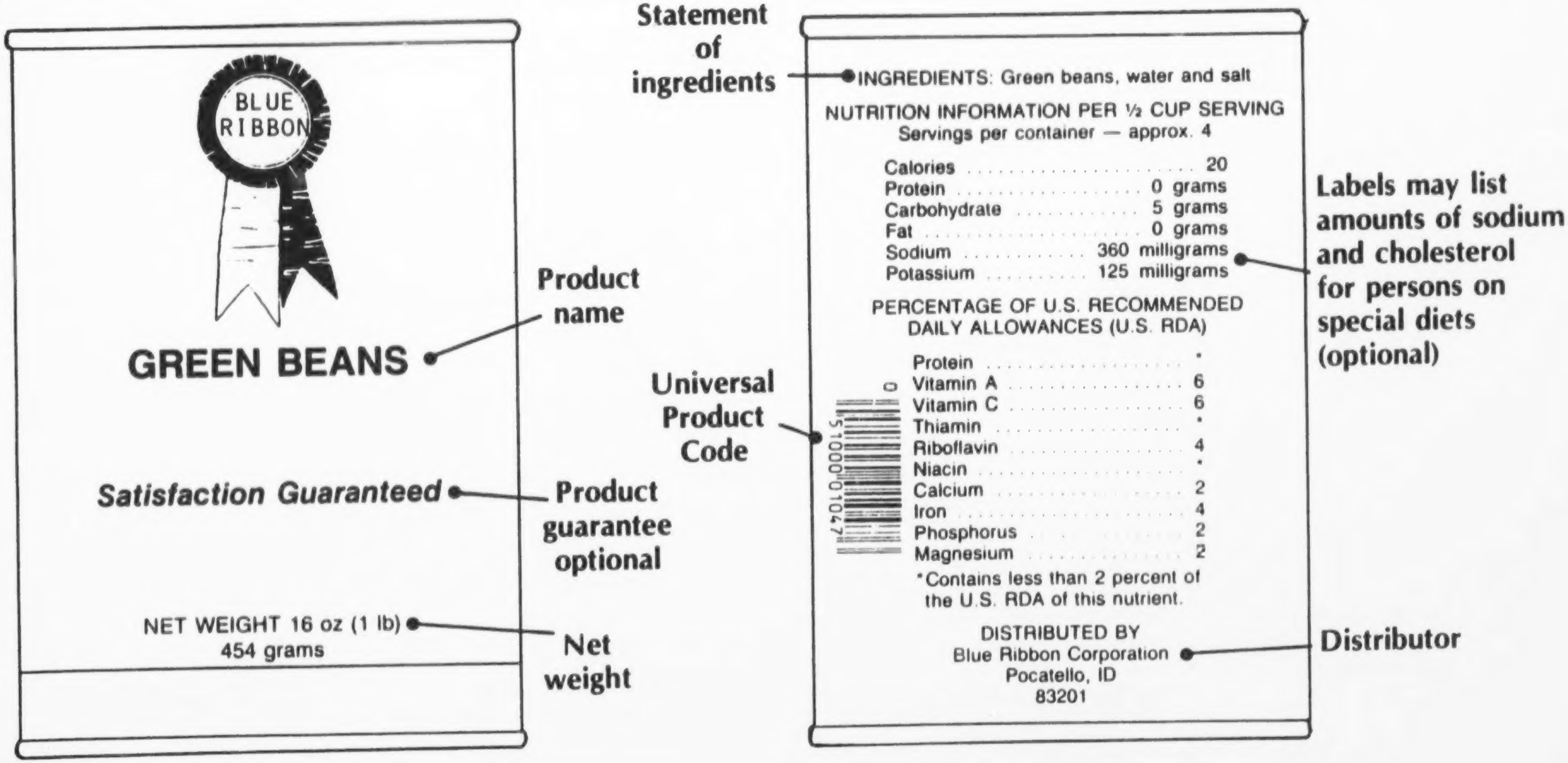
1. Not all bacteria in foods are bad. Certain bacteria are needed to make food products. Cheeses are made with bacteria.
2. Pasteurization is the process of heating to kill bad microorganisms.

Suggested Activities:

1. Use "Read the Label" (page 5) as a transparency or handout and discuss with the class what is found on a typical label.
2. Ask students to bring labels from home to read and discuss. Be sure to talk about the Universal Product Code, the nutrition label, ingredients and expiration date.
3. Cut labels from products and make collages.
4. Make a "rebus" glossary of ingredient words and write definitions.
5. Have students go through cupboards at home and read ingredient labels. Notice the listed order and report to the class on what they observed.

   What kinds of ingredients were listed first? last?

Read the Label



GREEN BEANS

Product name

Satisfaction Guaranteed

Product guarantee optional

NET WEIGHT 16 oz (1 lb)
454 grams

Net weight

Statement of ingredients

INGREDIENTS: Green beans, water and salt

NUTRITION INFORMATION PER ½ CUP SERVING
Servings per container — approx. 4

Calories	20
Protein	0 grams
Carbohydrate	5 grams
Fat	0 grams
Sodium	360 milligrams
Potassium	125 milligrams

Labels may list amounts of sodium and cholesterol for persons on special diets (optional)

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

Protein	*
Vitamin A	6
Vitamin C	6
Thiamin	*
Riboflavin	4
Niacin	*
Calcium	2
Iron	4
Phosphorus	2
Magnesium	2

*Contains less than 2 percent of the U.S. RDA of this nutrient.

Universal Product Code

0 51000 01047

DISTRIBUTED BY
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Pocatello, ID
83201

Distributor

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Name ______________________

Sanitation, Labeling and Handling of Food — What Have You Learned?

Directions:

Answer each of the following questions to the best of your ability. Write out the answers as fully as possible.

1. Define U.P.C. label. What do the initials mean?
2. Why is a U.P.C. label helpful?
3. What items are listed on the nutrition label?
4. Which ingredients on the package are listed first?
5. What does a date on the top or bottom of a package tell you?
6. What is a food product that uses bacteria in its production?
7. Why must foods be handled properly?
8. To keep some foods safe for consumption, they must be kept at ______°F or colder or ______°F and hotter. (Supply the missing temperatures.)
9. What is a microorganism?
10. A food product that claims it will be doing something for your health must have a ______________________.

Sanitation, Labeling and Handling of Food
Key — What Have You Learned?

1. Universal Product Code. It tells on a machine in the grocery store the cost of the package and the product name.
2. When you pay for the package, it tells the scanner the cost.
3. Statement of ingredients, nutrition information, percentage of U.S. recommended daily allowances, Universal Product Code, distributor.
4. First ingredients listed are those that have the largest amount in the product.
5. The contents will be freshest if used by that date.
6. Cheese
7. To prevent spoilage.
8. 45°F and 140°F
9. Small living things that can be helpful or harmful.
10. Nutrition label

Agribusiness
Unit 10

Agriculture and Media

Background — Agriculture and Media

Try to imagine your life without newspapers, television, radio, books magazines and billboards. The large amount of information that flows through these types of media would be gone. Our society is very dependent on mass communication. We look to the media for consumer information and job openings as well as specialized information needed for school, hobbies or understanding public affairs. We use all types of media to better understand the world around us.

Mass media also affects our beliefs, attitudes and opinions. It brings us closer together by bringing the world to our fingertips.

The processes in mass media today involve sophisticated technology. The computer, satellite and microprocessor have all impacted mass communications. Today, vast amounts of information can be stored on a minute microchip.

How do people involved in agriculture use the media? Farmers read newspapers and magazines for market and weather information. Advertisements alert them to new products or job openings. Television and radio educates as well as entertains the farmer. The news provides weather, market and government program information. As technology is advancing at such an accelerated rate, mass media is used to get all the current information to the agricultural community. Agribusiness people use the mass media to promote their products. They invite clients to meetings over the radio or by letter. Individuals involved in education in agriculture use magazines, books and television to present programs or articles describing new concepts to farmers and others. It would be hard to be involved in agriculture and not use the mass media everyday in your work. Success in agriculture is largely dependent upon the media.

Ohio produces many agricultural products. Products such as corn, soybeans, dairy products, beef, and pork are sold all over America as well as in other countries. With such large scale distribution and exportation of these products, using the media becomes a necessity for marketing. (A list of these products and their national rank in production are found on page 4.)

Many career opportunities are available for individuals as writers, broadcasters, advertising specialists and bookkeepers. The list goes on and on for exciting, rewarding careers mixing media and agriculture.

The next time you read a book, watch television, listen to the radio, scan through a magazine, view a billboard or go to a movie, remember you are using one of the many forms of mass media.

JOURNA
The Daily News

Lesson: **Agriculture & Media**

Resources:

Ads from TV, magazines, radio

Premise:

Advertising has a tremendous effect on our lives both good and bad. Many products grown in Ohio are advertised.

Objectives:

1. Students will select a raw product from among the top 10 commodities grown in Ohio and write an ad or commercial about it.
2. Select a processed product and write an ad for it.

Trivia:

1. About 98 percent of American households have at least one television set, and 57 percent have more than one.
2. *Reader's Digest* has 17,300,101 paid circulations per issue to lead magazines printed in the U.S.
3. In 1985, American businesses spent more than $95.8 billion on advertising.

Suggested Activities:

1. Have students select a product and research it for their ad. Make sure the ads are represented honestly and accurately. If students are to work in groups, have the group write an ad, then have them present it to the class. Videotape and record their presentations so they can see and hear their ad.
2. Have students list advertised products related to agriculture found in magazines, newspapers and seed catalogs. From the list discuss why they would or would not be purchased.
3. Have students make a collage from magazine ads for ag products in the shape of the state of Ohio traced on butcher paper. Include these ag products:
   a. dairy
   b. beef
   c. soybeans
   d. corn
   e. vegetables
   f. fruits

   Use as enrichment an extension of a product(s) grown in Ohio.

Ag Unit: **Ohio Ag Economics**

Core

Major: **Social Studies**

Minor: **Language Arts, Economics**

Related Lesson Plans

Ohio's Largest Industry

Remarks/Notes

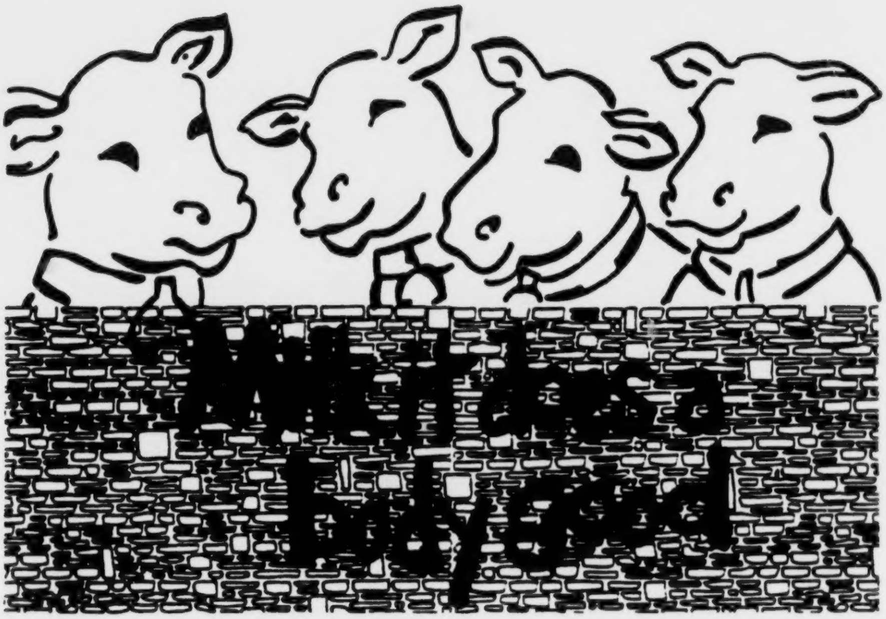
Background – U.S. Ranks in 1988 of Ohio Agricultural Products

Rank	Product/Commodity
First	Swiss cheese, Liederkranz cheese
Second	Tomatoes for processing
Third	Maple syrup, lowfat cottage cheese
Fourth	Eggs
Fifth	Chickens, ice cream, popcorn
Sixth	All vegetables for processing, soybeans, corn, celery, wine
Seventh	Sweet corn, cucumbers, strawberries, grapes,
Eighth	Hogs and pigs, oats, milk
Ninth	Tobacco, onions for storage
Tenth	Corn for silage, lettuce
Twelfth	Apples, winter wheat, sugar beets
Thirteenth	All fresh vegetables
Fifteenth	Sheep and lambs
Unranked	Beef, honey, nursery stock, flowers for greenhouse

Source: *Ohio Agriculture - A Profile by the Ohio Agricultural Statistics Service* - brochure, December 1989

Advertisement

Would You Buy This Product?
Why or Why Not?


Milk does a body good

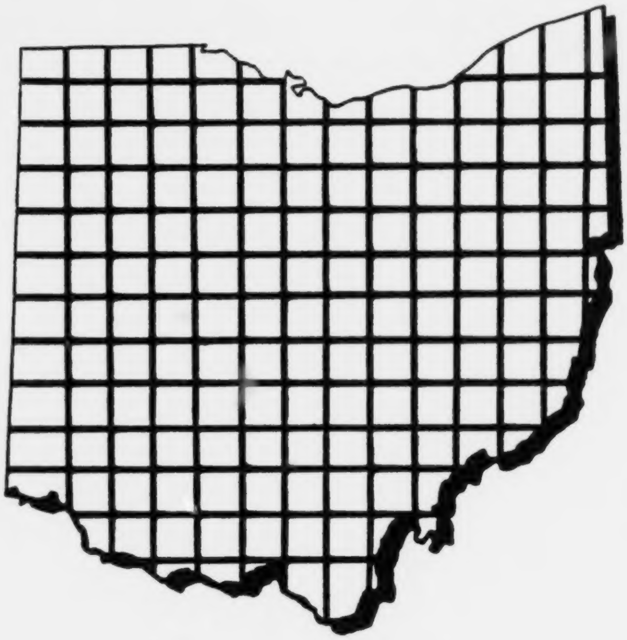
Facts about Ohio Agriculture in 1988

Number of Farms and Land in Farms

Year	Farms	Land in Farms - Average Acres
1970	118,000	149
1980	95,000	171
1984	90,000	176
1986	88,000	180
1987	84,000	186
1988	85,000	185
1989	87,000	181

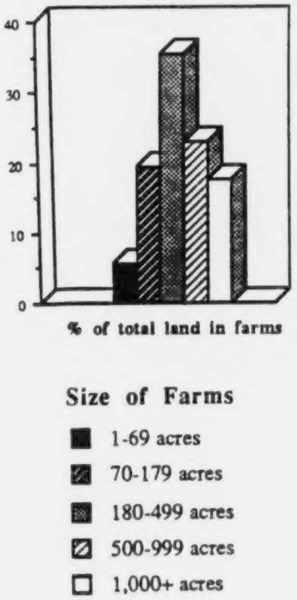
1988 Ohio Acres Harvested of Selected Commodities

Soybeans	3,700,000
Corn	3,250,000
Hay	1,625,000
Winter wheat	920,000
Oats	200,000
Tomatoes, processing	16,000
Sugar beets	14,700
Sweet corn	10,500
Potatoes	8,700
Tobacco	8,000
Total	9,752,900



26,240,000	acres in Ohio
15,800,000	acres in Ohio farmlands
11,900,000	acres in cropland
32,000	acres irrigated

Farm Operations by Size



Adapted from *Ohio Agriculture - A Profile by the Ohio Agricultural Statistics Service*, December 1989.

Name ______________________________

Agriculture and Media – What Have You Learned?

Directions: Answer each question as indicated.

1. Where there (**more farms** / **fewer farms**) when you were born than there are today?

2. In what year did Ohio have the fewest number of farms?

3. **True or False** – The average size of roughly 25 percent of Ohio farm operations is between 500 - 1,000 acres.

4. In 1988 the winter (**wheat** / **hay**) crop was larger, by acres harvested.

5. How many acres of available cropland are left for other commodities?

6. What other crops might be produced on this land?

7. What two crops account for over half the cropland acres in Ohio?

8. **True or False** – A majority of Ohio's cropland is irrigated.

9. In 1988 there were approximately 350 times the acres harvested of what crop than the acres of sweet corn harvested?

10. List the three kinds of information that mass media helps us understand.

Agriculture and Media Key – What Have You Learned?

1. more farms
2. 1987
3. True
4. Hay
5. 11 ,900,000
   9,752,900
   2,147,100
6. Many vegetables and fruits, canola, rye, some land not planted due to government programs.
7. Corn and soybeans
8. False
9. Soybeans
10. Consumer information, job openings, and specialized information such as school, hobbies, or understanding public affairs

Agribusiness
Unit 11

Careers in Agriculture

Background — Careers in Agriculture

Choosing a **career** can be the most important decision a person will make in a lifetime. That choice will determine employment, friends, associates, working conditions, residence, leisure time, standard of living, retirement security and happiness. Choice of a career is very important to you and it will determine how you will spend the rest of your life.

Each year thousands of young people quit school and go to **work**. Many feel that by dropping out of school and going to work that all their problems will be solved. Unfortunately, those who drop out of school are the same people who many times become unemployed or find the least opportunity for advancement. They have difficulty finding employment or advancing in a **job** because they did not complete their education.

In your grandfather's generation, education was not as important as it is today. In his generation, the labor market required more "strength" than "brain." Young people entering the labor force today need more skills than those of one or two generations ago. The labor market has little room for the unskilled or untrained person. Agriculture is advancing rapidly in technology and requires people with the most up-to-date general education as well as those with technical education.

As many as 40 percent of all the jobs, **occupations** and careers in our country have something to do with agriculture. A complete list would include more than 500 different occupations.

Agriculture has a job for any interest. It also has a job for you no matter how many years you go to school. There are jobs working both outdoors and indoors. There are jobs if you like working with people. There are jobs working with animals. There are jobs working with plants. There are jobs working as scientists, educators and administrators.

The field of agriculture has four major parts. **Production** refers to farmers producing food and fiber. **Processing** refers to changing food and fiber into usable products such as breakfast cereal and lumber. **Distribution** refers to moving the products from the processing plant to a place where they can be sold. **Marketing** refers to selling the agricultural products to the consumer.

Employees in the agricultural world of work may be categorized into eight occupational families:

1. Agricultural production
2. Agricultural supplies
3. Agricultural mechanics
4. Agricultural products
5. Ornamental horticulture
6. Agricultural resources
7. Forestry
8. Other agricultural occupations

Agricultural Production

This includes occupations related to livestock, field crops, fruit and vegetables, fiber and other crops or on commercial or part-time farms. It also involves occupations related to the economic use of agriculture land, labor, capital and management, the safe and efficient operation of modern farm equipment and the proper harvesting and handling of high quality agricultural products.

Ohio is well known for producing high quality crops. The foundation of the state's economy depends on production agriculture. Some farms grow only crops while other farms produce only animals or dairy cattle. Many Idaho farms combine both by growing crops that are fed to animals that are produced on the farm. The occupations listed below are separate and distinct occupations. However, the work of many Idaho farmers include a combination of several production agricultural occupations.

Some examples are livestock farmer, dairy farmer, crop farmer, general farmer, part-time farmer, farm manager, farm equipment operator, cattle ranch foreman, veterinary assistant, cattle buyer, small fruit grower, small grain grower, swine producer, corn producer, feedlot laborer, dairy farm manager, horse production employee, sheep rancher, beekeeper, chicken hatchery manager, fruit tree grower, vegetable grower, florist, turkey producer and poultry-egg producer.

Agricultural Supplies and Services

This area includes occupations that deal with activities in the processing and selling of agricultural supplies, such as agricultural chemicals, livestock feeds, seed, fertilizer and other supplies including small equipment. It also includes servicing agricultural equipment.

Many people are engaged in agricultural supplies and services occupations, all of which are important to Ohio's agriculture. New jobs are increasing in this area as agriculture continues to change. Some examples of agricultural supplies and services occupations include: agriculture supplies manager; service person; agriculture supplies applicator; equipment operator; warehouse person; sales clerk; bookkeeper; seed dealer; dairy, egg and poultry inspector; milk tester; laboratory animal assistant; pet shop worker; animal groomer; sheep shearer; well driller; pharmaceutical sales; livestock judge; crop duster; painter; welder; farm equipment mechanic; livestock buyer; fertilizer or ag product salesperson; seed cleaning person; and insurance salesperson.

Agricultural Products

This area deals with occupations involved in the preparation of agricultural products for sale such as meats, poultry and eggs; dairy products; fruits and vegetables; cereal grains; and non-food products (wool, cotton, tobacco). Occupations involve assembling, sorting, testing, grading, processing, and marketing of each agricultural product.

Many of Ohio's agricultural products need to be processed before they are sold to the consumer. There are several large processing companies in Ohio. Some examples of occupations in agricultural products are: meat processing manager, dairy products tester, meat and poultry products salesperson, poultry processor, economist, fruit and vegetable inspector, milk processor, cheese and butter processor, retail meat cutter, meat inspector, egg processor, seed analyst and grain elevator operator.

Agricultural Mechanics

The occupations in this area deal with sales and services of agricultural machinery and related equipment. Opportunities are available in assembly, adjustment, maintenance and repair of agricultural machinery, and agricultural buildings. Employees use tool processes and perform service operations.

Agriculture in Ohio is heavily mechanized. Farmers rely on people in agricultural mechanics to keep their equipment in excellent working order. Some examples of occupations in agricultural mechanics include agriculture machinery manager, tractor machinist, parts person, small engine mechanic, farm service department manager, electrician, agricultural engineer and agricultural machinery set-up person.

Ornamental Horticulture

This area deals with occupations related to production, sales and services in greenhouses, nurseries and garden centers and with the establishment of turf and landscape areas. Examples include: nursery or greenhouse manager, florist, garden center salesperson, landscape aide, nursery or greenhouse grower, greenskeeper, tree surgeon, parks and recreation foreman, tree pruner, floral designer, plant propagator, golf course maintenance worker, pest control specialist, landscape architect and nursery shipping clerk.

Agricultural Resources

The occupations in this area deal with the conservation and improvement of resources such as forested land and other natural areas; fish and wildlife; soil, water and air; and with the establishment, management and operation of recreational facilities.

Ohio has many state parks and recreational opportunities. The conservation of Ohio' s topsoil is very important to the farmer. Some examples in agricultural resources are recreation farm manager, soil conservation officer, wildlife conservation officer, fish hatchery worker and park worker.

Forestry

This area deals with occupations in the management of trees grown as a crop. Aspects of forestry are protection, logging, wood utilization, recreation and special products. Examples include forester, forest ranger, forestry aide, log grader, saw mill operator and Christmas tree grower.

Other Agricultural Careers

The occupations in this area concern specialized business services, education, inspection, regulation and other government services ordi-

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narily not included in the first seven categories. A farm background and training in agriculture provide prospective employees with a broad background in agriculture which often leads to successful employment in many varied agricultural occupations.

Ohio has a wide variety of jobs available in agriculture. Many jobs in agriculture offer support services for the other phases of agriculture. Some examples of other agricultural occupations include the following: agriculture education instructor, county agricultural extension agent, farm loan officer, veterinarian, field reporter, agricultural reporter, food and drug inspector, agricultural professor, agricultural journalist, farm media broadcaster, photographer and research scientist.

The agricultural world of work contains a bright future for many individuals who have an interest in some phase of agriculture. Agricultural occupations are found off the farm as well as on the farm. The agricultural industry employs a larger number of employees than any other single industry. Demands for more agricultural services and increased processing and distribution of quality agricultural products are increasing employment opportunities in agricultural occupations off the farm.

Farmers buy supplies from many different people. They buy tractors from a machinery dealer. They buy fertilizer from a fertilizer dealer. They borrow money from banks. They buy feed at feedstores. They buy tools from hardware stores.

Farmers sell products to different people. They sell corn and potatoes. They sell milk. They sell cattle and hogs. They sell vegetables. They sell wheat.

The people who sell products to farmers are part of agriculture. Farmers are part of agriculture. The people who buy products from farmers are part of agriculture.

One of the best ways to find out if you have an interest in working in a job related to agriculture is to visit with a person who is employed at that job. Or better yet, when you are old enough to work, you may find summer employment opportunities in agriculturally related areas. That way you could experience agricultural related work first hand.

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Lesson: **Careers in Agriculture**

Resources:

Encyclopedias, dictionaries, farm magazines, crayons, markers, scissors and brads.

Premise:

The total agricultural industry is an important part of the world of work and is one of the most vital segments of the nation's and Idaho's economy. It is important that 4th graders realize there are many jobs related to agriculture.

Objectives:

1. Students will become aware that there are many jobs in the United States that have something to do with agriculture.
2. Students will understand that the farmer requires many services that result in many agriculturally related jobs.
3. Develop an awareness that different jobs in agriculture require workers with different abilities and educational preparation.

Motivation:

1. Students can be asked who they know that is working in an agricultural related job.
2. Students can develop a list on the chalkboard of at least 10 jobs that are related to the job of farming.
3. Students can answer the question: What is one job in agriculture that the students would like to have?

Vocabulary:

1. Career — one's progress through life, an occupation or profession
2. Job — employment or work
3. Occupation — that which occupies one's time, work or profession
4. Work — employment or occupation
5. Production — farmers producing food
6. Processing — changing food and fiber into usable products such as breakfast cereal and lumber
7. Distribution — moving the products from the processing plant to a place where they can be sold
8. Marketing — selling agricultural products to the consumer
9. Consumer — a person who uses goods or services for his/her own needs
10. Occupational names may need to be explained as they are presented in background material

Ag Unit: **Careers in Ag Core**
Major: **Social Studies**
Minor: **Language Arts**

Related Lesson Plans

Ohio's Largest Industry

Remarks/Notes

Trivia:

1. In 1988 the United States exported $35.3 billion of farm products to other countries. This created about 1,300,000 jobs for people in the United States.
2. Approximately 21 million people now work in agriculture and ag-related fields in the United States.
3. It is estimated that more than 48,000 employment openings will become available each year in the United States for college graduates. These openings will be in agriculture, natural resources, veterinary medicine and closely allied fields. Yet, fewer than 44,000 qualified college graduates will be looking for these jobs, thus resulting in a shortage of about 10 percent.
4. Only 2 out of 100 people are farmers in America. However, they feed many other countries. One farmer produces enough food to feed 92 Americans and 22 people who live in other countries.

Suggested Activities:

1. Students study "Agricultural Careers" background and memorize the eight career families and their meanings. Be able to list on paper three or more occupational families (see the "Background" handout).
2. Use the "Word Find Game" (page 8) to find a variety of agriculturally related occupations. (This could also be used to introduce the complete "Careers" unit.)
3. Use handouts "How Many Hats Does a Farmer Wear?" (pages 10-11). Instructions are included on handout.
4. Using handout worksheet "A Career 'ist' Search" (page 12), students use dictionaries or encyclopedias to match careers to definitions.
5. Allow students an opportunity to set up an interview using the criteria as outlined in the handout, "A Country Interview" (page 13). Contact any of the following local agencies for names of local farmers: cooperative extension service, soil conservation service, agriculture education instructors, farm bureau, and many other agricultural organizations.

   Or the teacher could invite a farmer in as a resource person for students to interview. Students report their findings to the class. When constructing questions, students must ask educational background and interests about the person being interviewed.
6. Hand out "Careers in Agriculture" (page 14) worksheet and discuss activity with students according to instructions given at the bottom of the page. Stories students write may be written on barn-shaped paper to be included in the unit "Ohio's Largest Industry."
7. Students may select a different career topic than the one explored in activity 5. Hand out copies of "Farming Career Scope" instruction page, "Career Scope Cover Page" and "Career Scope Task Illustration Page" (pages 15, 16, and 17). Be sure to include in one caption, educational preparation and abilities.
8. Make collages using pictures from magazines showing agriculturally related careers. Students divide into groups and classify pictures according to interest and agricultural background.
9. Make a bulletin board entitled "Agriculture Provides Jobs for the U.S.A." Pictures from magazines showing agriculturally related occupations may be included. Students research the occupations and write a report to include with the picture. Again, stress to the students to include background and educational preparation of the careerist.
10. Using the theme suggested in activity 8, construct a bulletin board including "Help Wanted Advertisements" from agricultural magazines or newspapers. Classify available positions by agricultural categories and education required.
11. Student learning for "Careers" unit may be evaluated by administering the test, "What Have You Learned?" included at the end of the unit.

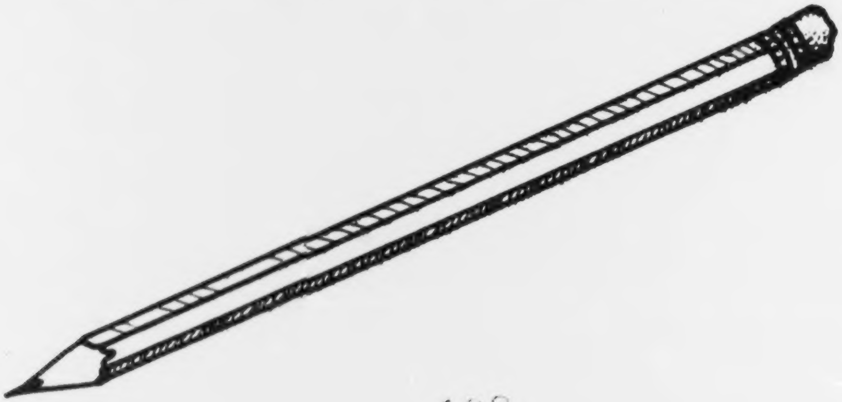
Name ______________________

Word Find Game

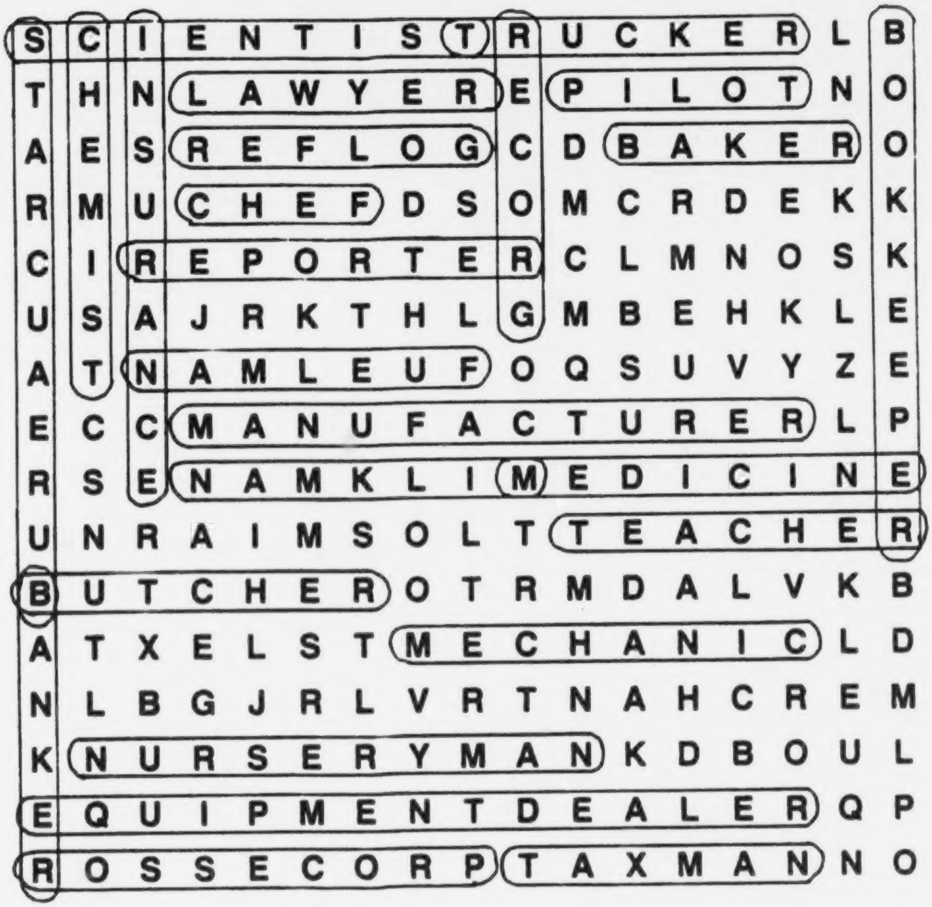
Many occupations are related to or dependent upon agriculture. Can you find the names of 25 jobs that go hand in hand with farming? The words go up and down and across frontwards and backwards only. The game includes a bonus word. See if you can find it.

Baker
Banker
Bookkeeper
Bureaucrats
Butcher
Chef
Chemist
Equipment Dealer
Fuelman
Golfer
Grocer
Insurance
Lawyer
Manufacturer
Medicine
Merchant
Milkman
Nurseryman
Pilot
Processor
Reporter
Scientist
Taxman
Teacher
Trucker
Mechanic (bonus)

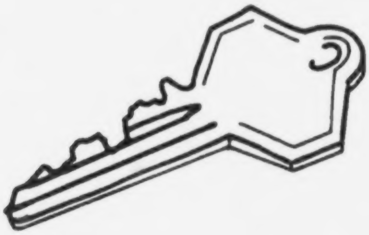
S	C	I	E	N	T	I	S	T	R	U	C	K	E	R	L	B
T	H	N	L	A	W	Y	E	R	E	P	I	L	O	T	N	O
A	E	S	R	E	F	L	O	G	C	D	B	A	K	E	R	O
R	M	U	C	H	E	F	D	S	O	M	C	R	D	E	K	K
C	I	R	E	P	O	R	T	E	R	C	L	M	N	O	S	K
U	S	A	J	R	K	T	H	L	G	M	B	E	H	K	L	E
A	T	N	A	M	L	E	U	F	O	Q	S	U	V	Y	Z	E
E	C	C	M	A	N	U	F	A	C	T	U	R	E	R	L	P
R	S	E	N	A	M	K	L	I	M	E	D	I	C	I	N	E
U	N	R	A	I	M	S	O	L	T	T	E	A	C	H	E	R
B	U	T	C	H	E	R	O	T	R	M	D	A	L	V	K	B
A	T	X	E	L	S	T	M	E	C	H	A	N	I	C	L	D
N	L	B	G	J	R	L	V	R	T	N	A	H	C	R	E	M
K	N	U	R	S	E	R	Y	M	A	N	K	D	B	O	U	L
E	Q	U	I	P	M	E	N	T	D	E	A	L	E	R	Q	P
R	O	S	S	E	C	O	R	P	T	A	X	M	A	N	N	O



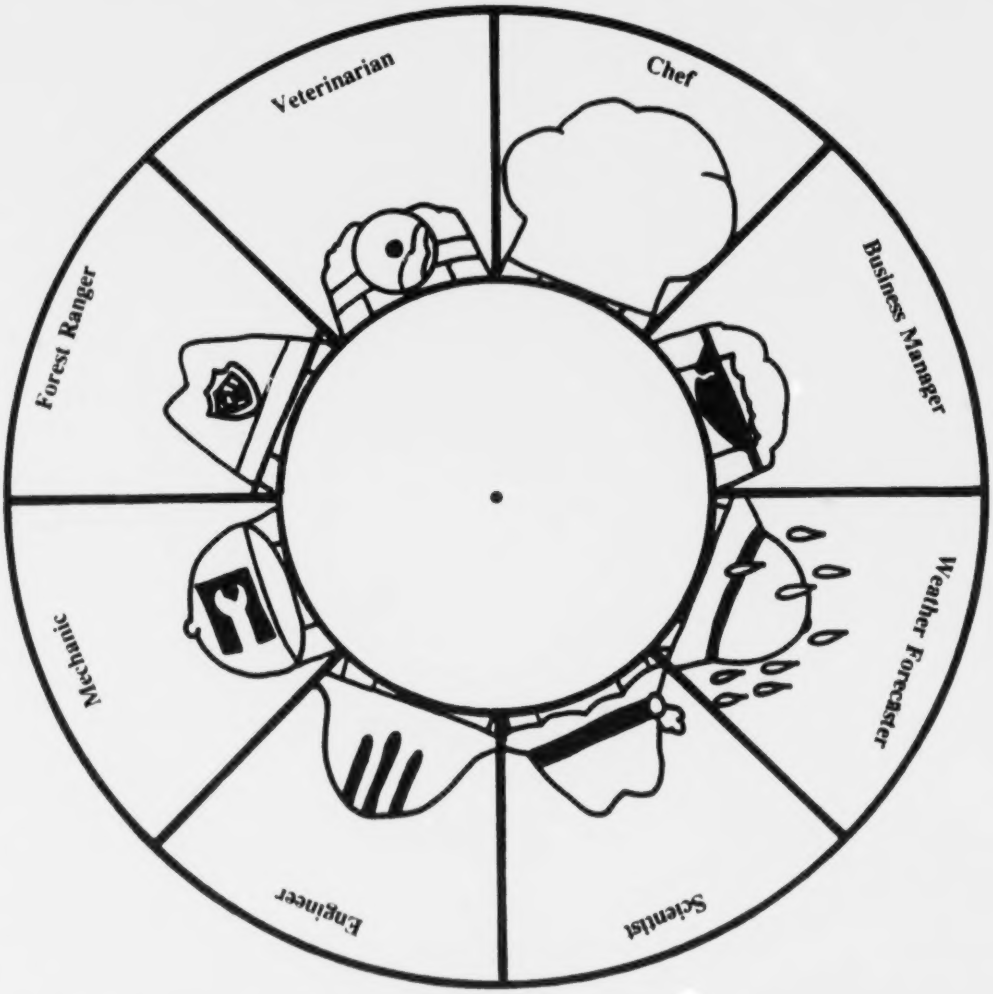
Word Find Game — Key



S	C	I	E	N	T	I	S	T	R	U	C	K	E	R	L	B
T	H	N	L	A	W	Y	E	R	E	P	I	L	O	T	N	O
A	E	S	R	E	F	L	O	G	C	D	B	A	K	E	R	O
R	M	U	C	H	E	F	D	S	O	M	C	R	D	E	K	K
C	I	R	E	P	O	R	T	E	R	C	L	M	N	O	S	K
U	S	A	J	R	K	T	H	L	G	M	B	E	H	K	L	E
A	T	N	A	M	L	E	U	F	O	Q	S	U	V	Y	Z	E
E	C	C	M	A	N	U	F	A	C	T	U	R	E	R	L	P
R	S	E	N	A	M	K	L	I	M	E	D	I	C	I	N	E
U	N	R	A	I	M	S	O	L	T	T	E	A	C	H	E	R
B	U	T	C	H	E	R	O	T	R	M	D	A	L	V	K	B
A	T	X	E	L	S	T	M	E	C	H	A	N	I	C	L	D
N	L	B	G	J	R	L	V	R	T	N	A	H	C	R	E	M
K	N	U	R	S	E	R	Y	M	A	N	K	D	B	O	U	L
E	Q	U	I	P	M	E	N	T	D	E	A	L	E	R	Q	P
R	O	S	S	E	C	O	R	P	T	A	X	M	A	N	N	O



How Many Hats Does a Farmer Wear?

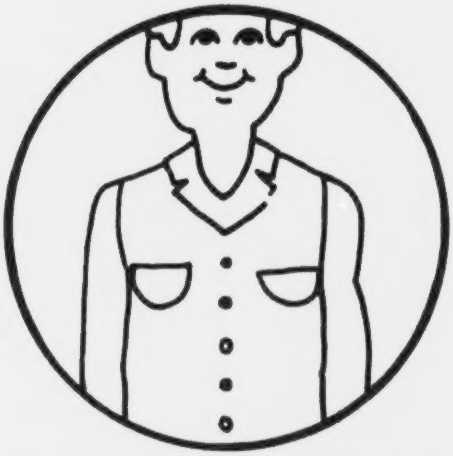


You are beginning to see that there are many different kinds of farms. There are also many different kinds of jobs that all need to be done by one farmer. Every farmer has to know how to do a great many things.

Cut out the two circles on this page and the next one and fasten all three circles in the center. Make sure the largest circle is on the bottom and the smallest one is on the top. You will be able to spin all three circles separately.

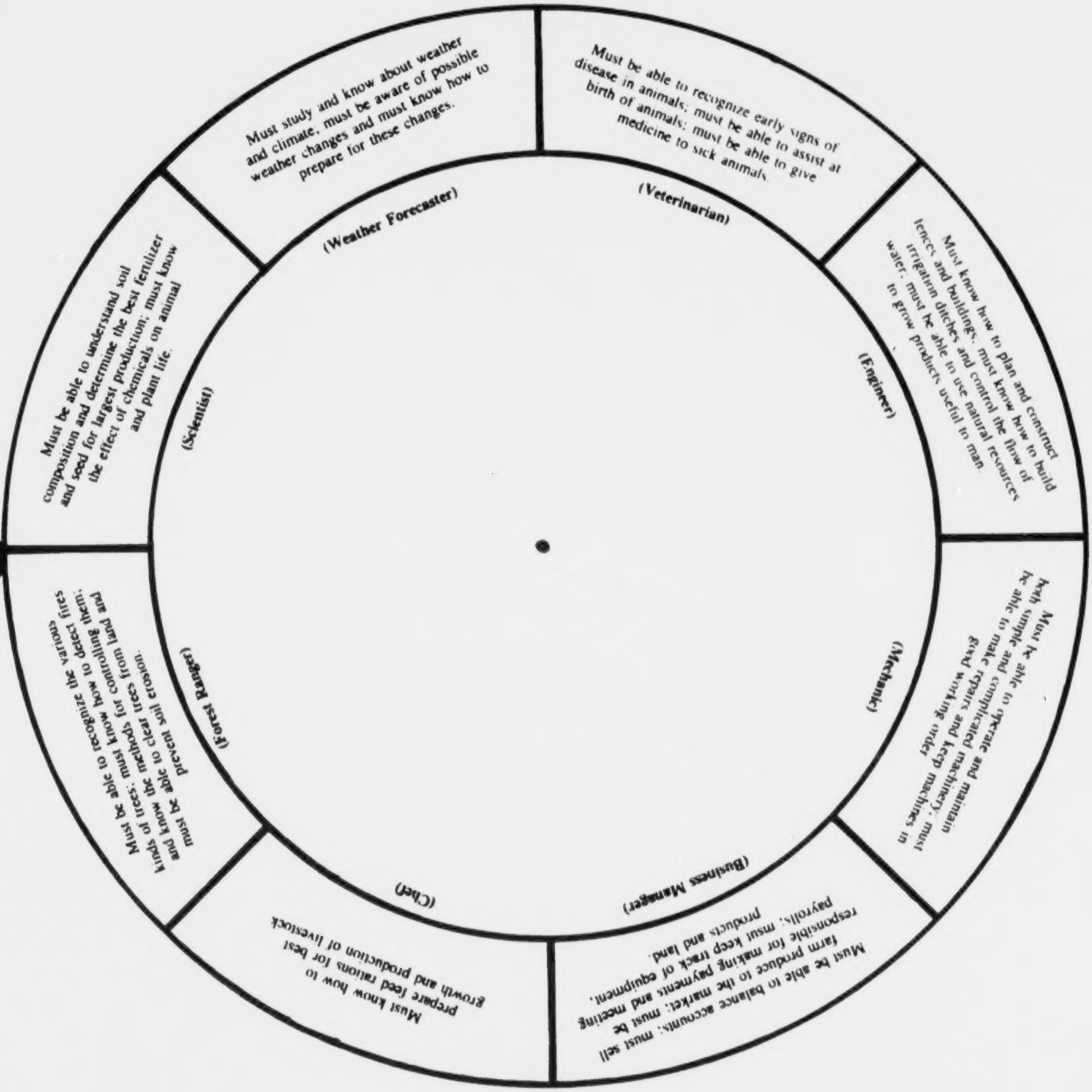
Find a hat on the second circle and put it on the farmer's head. Then try to find the words that best describe what the farmer does when he/she is wearing that hat.

Not every farmer has to wear all the hats, but he/she usually has to know something about each job. Sometimes the farmer will have to call a specialist for assistance.



Adapted with permission from National FFA organization's "Food for America," materials sponsored by Mobay Corporation, Agricultural Chemicals Division, as a special project of the National FFA Foundation, Inc.

How Many Hats Does a Farmer Wear?



Must study and know about weather and climate; must be aware of possible weather changes and must know how to prepare for these changes.

(Weather Forecaster)

Must be able to recognize early signs of disease in animals; must be able to assist at birth of animals; must be able to give medicine to sick animals.

(Veterinarian)

Must know how to plan and construct fences and buildings; must know how to build irrigation ditches and control the flow of water; must be able to use natural resources to grow products useful to man.

(Engineer)

Must be able to operate and maintain both simple and complicated machinery; must be able to make repairs and keep machines in good working order.

(Mechanic)

Must be able to balance accounts; must sell farm produce to the market; must be responsible for making payments and meeting payrolls; msut keep track of equipment, products and land.

(Business Manager)

Must know how to prepare feed rations for best growth and production of livestock.

(Chef)

Must be able to recognize the various kinds of trees; must know how to detect fires and know the methods for controlling them; must be able to clear trees from land and prevent soil erosion.

(Forest Ranger)

Must be able to understand soil composition and determine the best fertilizer and seed for largest production; must know the effect of chemicals on animal and plant life.

(Scientist)

BEST COPY AVAILABLE

Name ____________________

A Career "ist" Search

(Dictionary Activity)

Many "ist" occupations can be related to agriculture. Match the following careers with their related jobs. Use reference books to help you.

________ 1. Apiarist
________ 2. Anthropologist
________ 3. Agriculturist
________ 4. Bacteriologist
________ 5. Biochemist
________ 6. Biologist
________ 7. Biophysicist
________ 8. Botantist
________ 9. Conservationist
________ 10. Economist
________ 11. Entomologist
________ 12. Geophysicist
________ 13. Horticulturist
________ 14. Hydrologist
________ 15. Meteorologist
________ 16. Microbiologist
________ 17. Pedologist
________ 18. Zoologist

A. Studies the soil
B. Scientific study of plants
C. Studies insects
D. Scientific study of farming methods
E. Studies water
F. Studies the atmosphere
G. Studies the production and distribution of goods and services
H. Studies chemicals in living things
I. Studies animals
J. Studies beekeeping
K. Studies the physics of living things
L. Studies the raising and caring of plants
M. Studies living things seen through a microscope
N. Studies the physics of geology
O. Studies and supports saving the natural environment
P. Studies man
Q. Studies bacteria
R. Studies living things

A Country Interview

One of the best ways to learn about farming in Ohio is from an Ohio farmer.

This activity requires you to interview a farmer and then write a story about that interview.

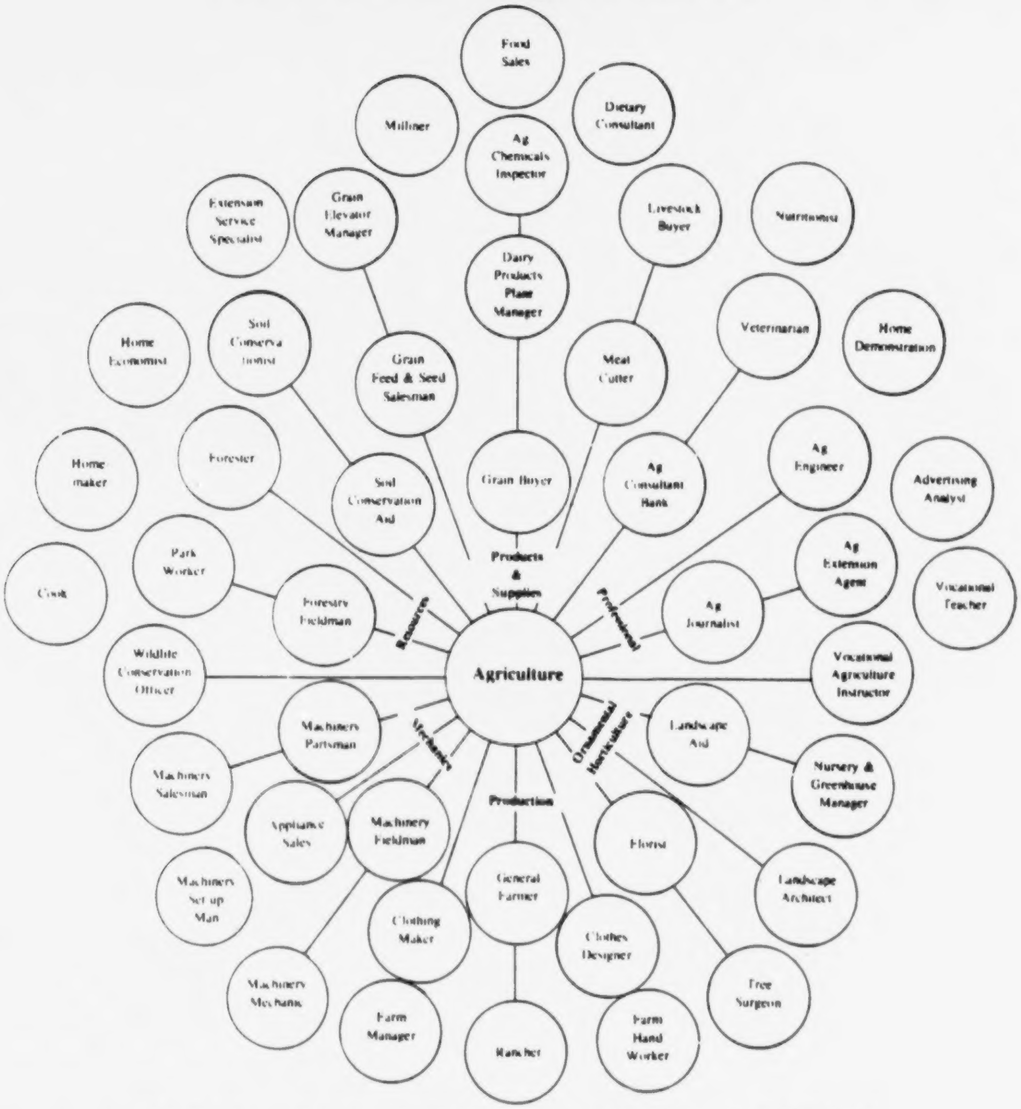
Follow these steps to arrange the interview.

1. Select a farmer in your community to interview.
2. Contact the person and tell him/her that you would like to interview him/her to learn more about farming in your area.
3. Set up a date, time and place for the interview or arrange for a telephone interview. Be sure to be on time.
4. Prepare questions ahead of time.
5. Speak up clearly and be courteous. You may want to use a tape recorder for your interview.
6. Thank the person properly for taking time out of his work day to allow you to interview him/her.
7. Write a thank you letter and mail it to the farmer you interviewed.

Career "ist" Search Key

1. J
2. P
3. D
4. Q
5. H
6. R
7. K
8. B
9. O
10. G
11. C
12. N
13. L
14. E
15. F
16. M
17. A
18. I

Careers in Agriculture


Food Sales
Milliner
Dietary Consultant
Ag Chemicals Inspector
Extension Service Specialist
Grain Elevator Manager
Livestock Buyer
Nutritionist
Dairy Products Plant Manager
Home Economist
Soil Conservationist
Grain Feed & Seed Salesman
Meat Cutter
Veterinarian
Home Demonstration
Homemaker
Forester
Soil Conservation Aid
Grain Buyer
Ag Consultant Bank
Ag Engineer
Advertising Analyst
Cook
Park Worker
Forestry Fieldman
Products & Supplies
Resources
Professional
Ag Journalist
Ag Extension Agent
Vocational Teacher
Wildlife Conservation Officer
Agriculture
Vocational Agriculture Instructor
Machinery Partsman
Mechanics
Ornamental Horticulture
Landscape Aid
Nursery & Greenhouse Manager
Machinery Salesman
Appliance Sales
Machinery Fieldman
Production
Florist
General Farmer
Landscape Architect
Machinery Set up Man
Clothing Maker
Clothes Designer
Tree Surgeon
Machinery Mechanic
Farm Manager
Rancher
Farm Hand Worker

Forty percent of all jobs and occupations in the U.S. are related to agriculture.

1. Select an agricultural related job from the above chart (or choose your own) that looks interesting to you.
2. Research what is required of a person who does this job.
3. On another sheet of paper, write a short report about this job. Be sure to include answers to the following questions:
   a. What will I do on the job?
   b. Where will I work?
   c. What kind of training or education will I need?
4. Be sure to use complete sentences.
5. Draw a picture of yourself doing this job. Don't forget appropriate clothing and setting.

Farming Career Scope

(Career Research Activity)

Supplies:

Tag board, brads, colored pencils, crayons, markers, task illustration page and cover page.

Introduction:

Agriculture is far more than growing crops, important as it is. Agriculture is the foremost and largest of all America's industries. Opportunities in agriculture-related careers are varied and abundant.

Procedure:

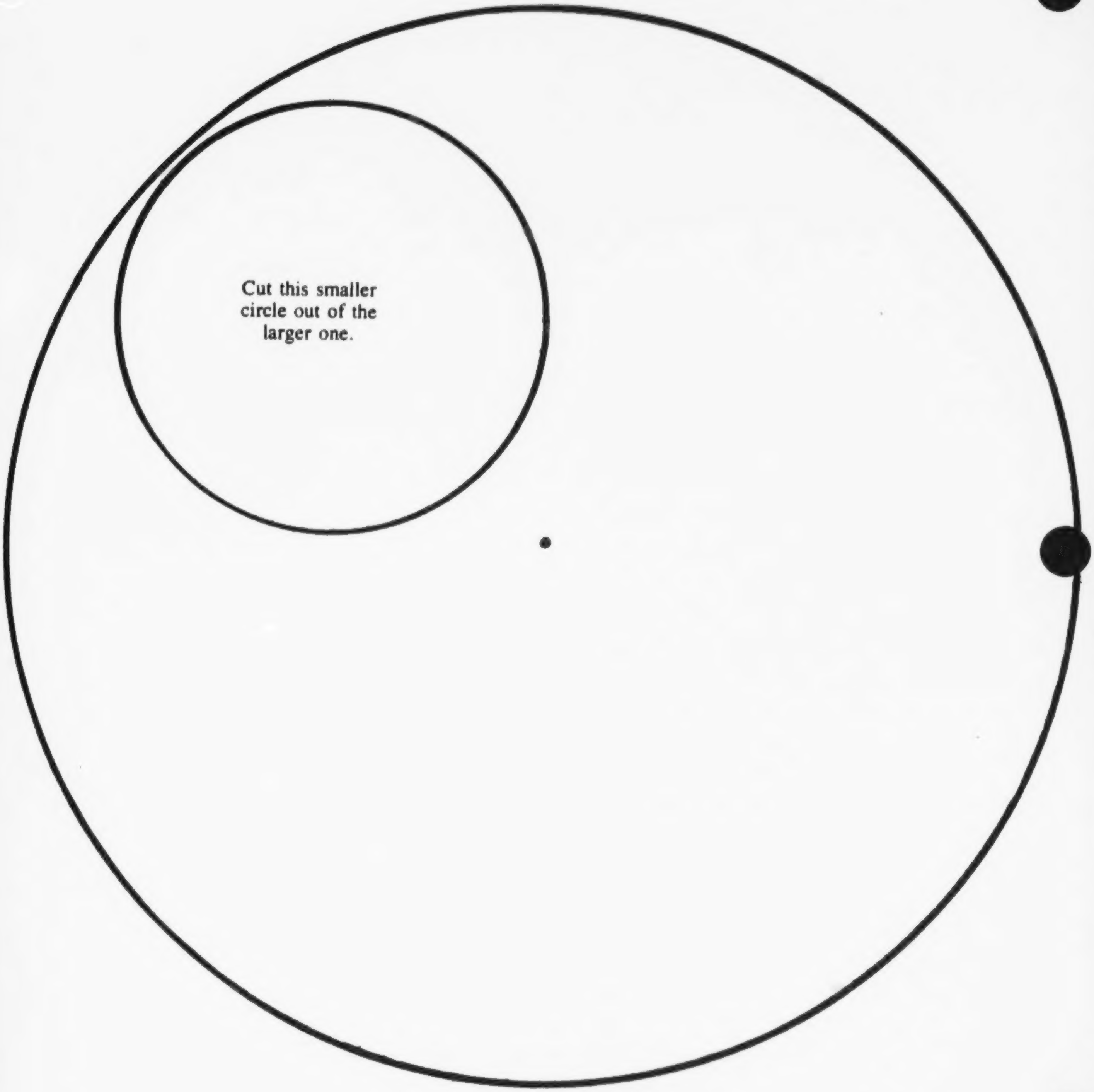
1. Use the ditto entitled "Careers in Agriculture."
2. Each student may select a career he or she would like to research.
3. After researching, choose four important tasks related to that career.
4. Write a caption to explain the task and illustrate it in the four circles provided on the task illustration page.
5. Cut out the smaller circle inside the large circle in the career scope cover page.
6. Assemble your career-scope circle book. Place a brad in the center to join the two circles together.

Other Ideas:

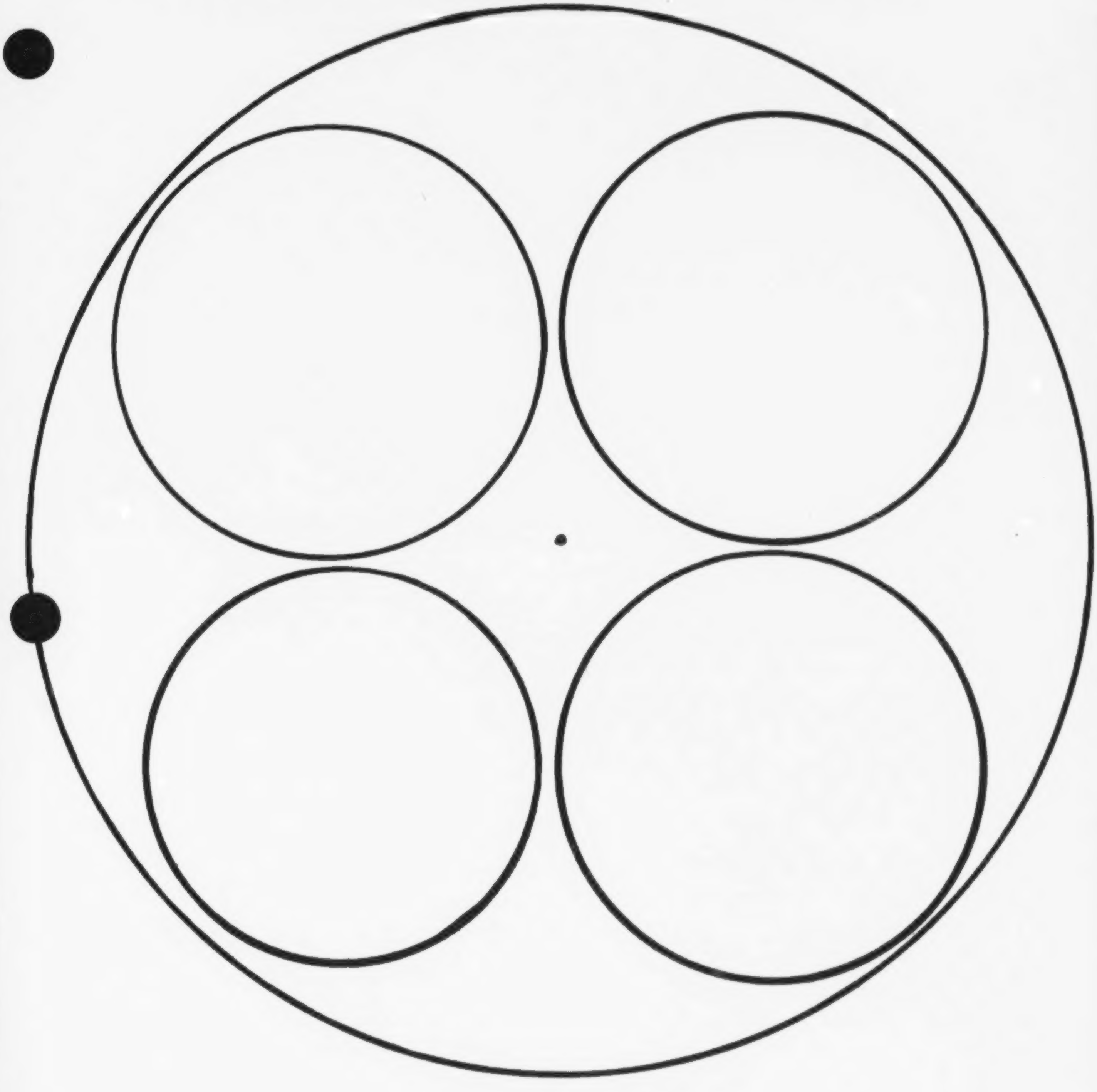
1. Byproducts of Ohio crops.
2. Byproducts of livestock.
3. Machinery and their uses.
4. Choose a product and explain the process from production, processing, distribution to retailing.

Adapted with permission from North Dakota.

Career Scope Cover Page


Cut this smaller
circle out of the
larger one.

Career Scope Task Illustration Page



Name ______________________

Careers in Agriculture —
What Have You Learned?

1. Which of the following choices tells how many people in America are farmers?
   a. 1 out of 100
   b. 3 out of 100
   c. 10 out of 100
   d. 25 out of 100
2. One farmer produces enough food to feed how many people?
   a. 30
   b. 86
   c. 114
   d. 149
3. Which of the following choices is **not** a good reason for finishing school?
   a. A person who finishes school may make more money.
   b. A person who finishes school may advance in jobs quicker.
   c. A person needs more skills today than he did several generations ago.
   d. A person's problems will usually be solved.
4. **Processing** refers to:
   a. Changing food and fiber into usable products
   b. Growing food and materials for clothing
   c. Moving a product to a place to be sold
   d. Selling the agricultural products to the consumer
5. Which of the following choices is **not** an occupational family?
   a. Agricultural supplies and services
   b. Forestry
   c. Ornamental horticulture
   d. Computer manufacturing
6. If you are interested in a career in agriculture, which of the following choices would be a least desirable way to help you decide?
   a. Talk to other people with agricultural careers
   b. Get summer employment helping on a farm
   c. Earn enough money to buy a small farm
   d. Join 4-H or FFA
7. If you were interested in working outdoors or if you enjoyed planting flowers and working in the lawn, you might be interested in which of the following careers?
   a. seed analyst
   b. landscape aide
   c. pest control specialist
   d. nursery grower
8. If you enjoyed fixing machines and wanted to work inside during the winter, which occupation might you consider?
   a. small engine mechanic
   b. tractor operator
   c. warehouse person
   d. sawmill operator

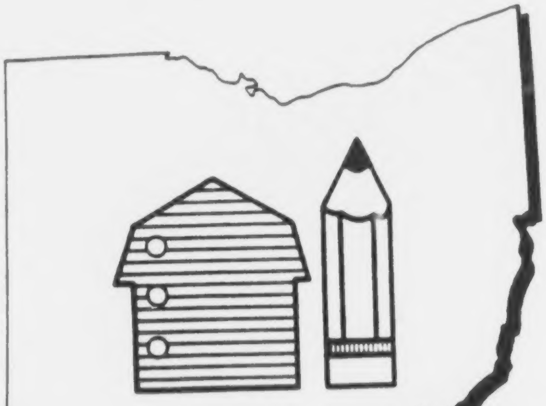
9. If you enjoy math and science, which of the following would least likely be a good career choice?
   a. farmer
   b. feed store operator
   c. loan officer
   d. pet store clerk
10. We have been studying careers in agriculture. Choose one of the following careers and write a conversation two people might be having as they are working at their jobs. Be sure to include kinds of tools or equipment you would be using, location of your job and anything else you think would be important to talk about as you work.
    a. Christmas tree grower
    b. Chicken hatchery operator
    c. Livestock farm manager
    d. A career of your choice
11. Pretend you are filling out an application to work at a feed store during your summer vacation. List five reasons that would make the store owner believe he/she should hire you for the job.
12. Pretend you are interested in becoming a farmer. List five other occupations you would need to be able to do in order to be a farmer.

Careers in Agriculture Key —
What Have You Learned?

1. b
2. c
3. d
4. a
5. d
6. c
7. b
8. a
9. d
10. Answers will vary
11. Answers will vary
12. Answers will vary

Plants

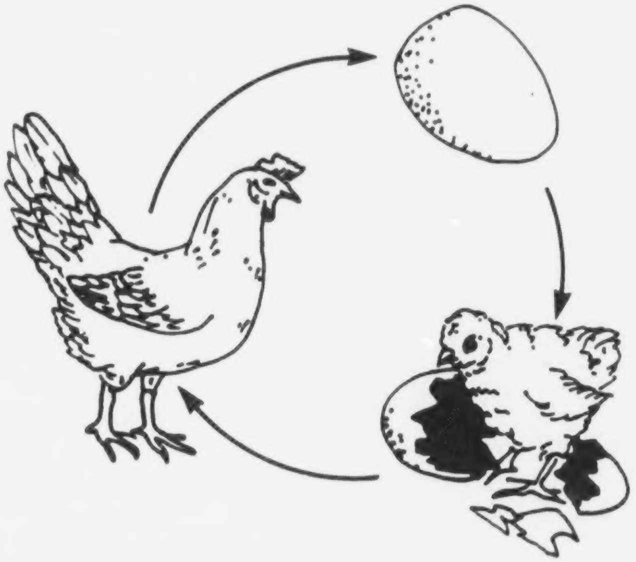
Unit	Title
12.	The Start of Life – the Life Cycle
13.	Biotechnology in Agriculture
14.	Micronutrients
15.	Plant Growth
16.	Crop Production Steps
17.	Corn
18.	Soybeans and Other Legumes
19.	Small Grains
20.	Fruit Crops
21.	Tree Farming

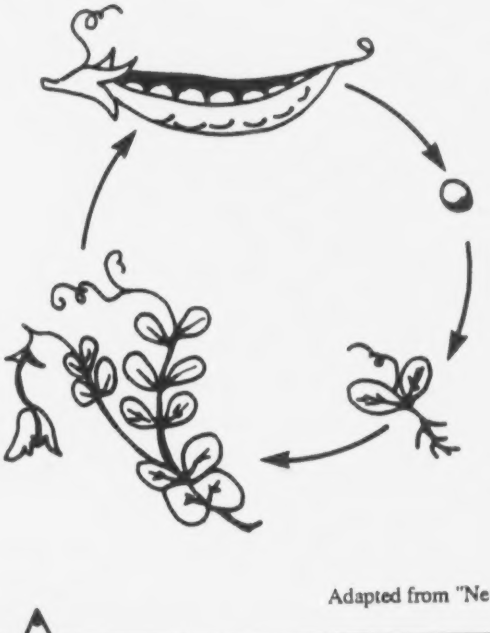


The Start of Life – Life Cycle

Background — Life Cycle

Successful agriculture is dependent upon the knowledge and manipulation of the life cycles of plants and animals. Science texts usually contain good pictures and descriptions of life cycles. However, the connection of life cycles to agriculture may not be made. This lesson is designed to explain some life cycles used in agriculture and to help students understand how this information is put to use.





Adapted from "New York Is Growing," New York.

Lesson: The Start of Life — Life Cycle

Resources:

Hatching chicks. The Chicken and the Egg. Cows, Calves and Milk. Peas Are Seeds Too! Worksheet.

Premise:

Successful agriculture is dependent on the knowledge and manipulation of the life cycles of plants and animals.

Objectives:

1. Recognize the relationships of the life cycles of plants and animals to agriculture.

Specific things to look for:

1. Name the three stages in life cycle of the chicken and cow.
2. Is the same thing true of the pea?
3. Each starts with a ________________________. (seed)

Motivation:

The life cycle of all living things is similar. How much do the students already know?

1. Can you describe a baby calf and a baby chicken?
2. Do you know why people raise chickens? (for eggs, broilers, fryers and stewing)

Vocabulary:

1. Pod — holder for the peas seed vessel
2. Seeds — the life germ of any living thing
3. Sprouting — beginning to grow
4. Hen — adult female chicken
5. Organism — living cells
6. Broiler — a young chicken of frying size
7. Hatch — break the shell and emerge
8. Dry up — cease to give milk
9. Mammal — animal that nurses its young

Ag Unit: **Food and Fiber Core**

Major: **Science**

Minor: Language Arts

Related Lesson Plans

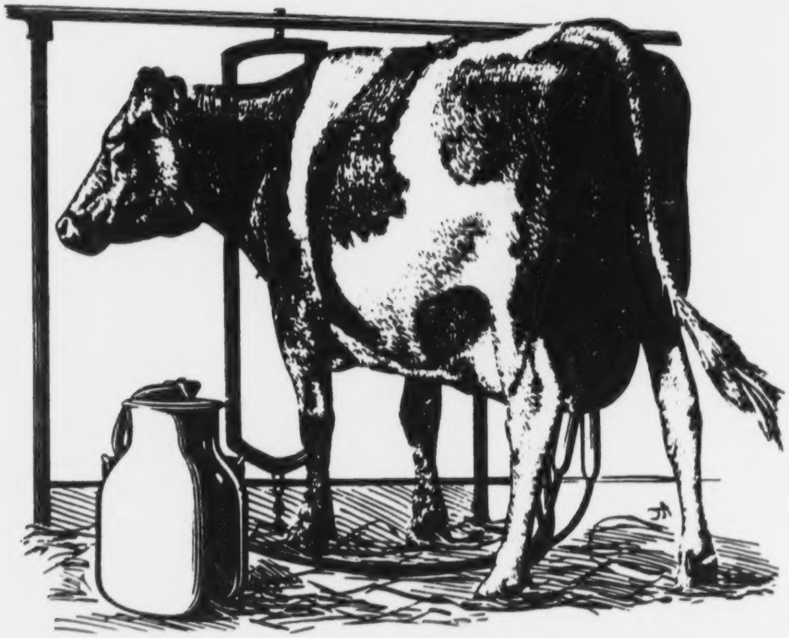
Biotechnology in Agriculture

Plant Growth

Remarks/Notes

Suggested Activities:

1. Read the material provided about the life cycles of chickens, cows and the pea plant (pages 5, 6 and 7).
2. Worksheet — Crossword Puzzle coordinated with the material on life cycles (page 11).
3. You can provide a real life experience by hatching eggs in an incubator in your classroom. You may get the necessary materials, instructions and assistance from your Cooperative Extension 4-H/Youth Specialist, high school agricultural or science departments (pages 8 and 9).
4. You can grow plants from seeds in your classroom, using information and instructions in the Plant Growth Unit (Unit 15 — pages 7, 8 and 9).
5. You can have a class discussion to relate various common foods to their place in the life cycle of plants and animals.



Adapted from "New York Is Growing," New York.

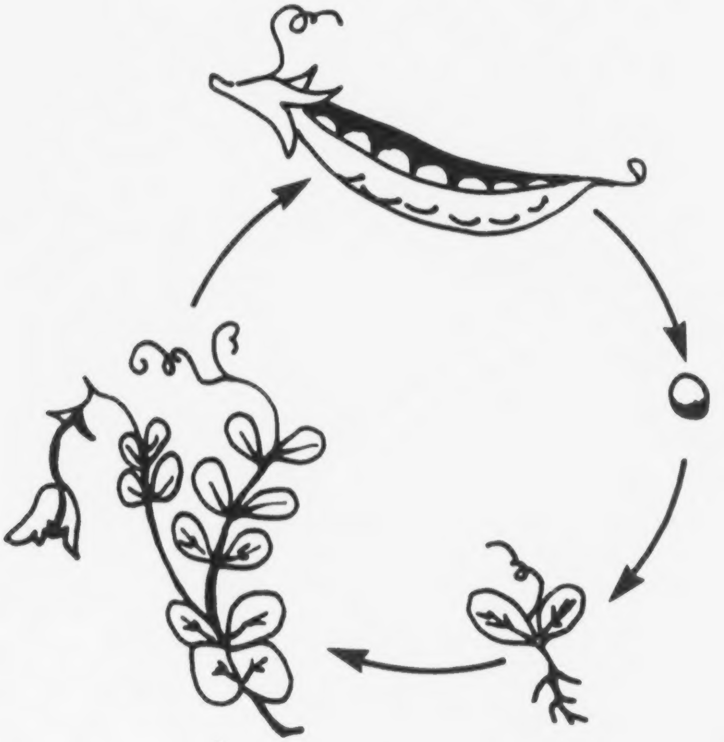
Peas Are Seeds Too!

Plants have life cycles too. The life cycle of plants is very important to agriculture. Let's look at a pea plant.

If you plant a pea seed in the ground, it will sprout into a tiny seedling. The seedling will grow into an adult plant. The plant will produce flowers. The flowers have both male and female parts. The male part has the pollen. The female has the ovum. The pollen fertilizes the ovum to allow a new pea seed to grow. The new seeds and part of the flower become the pea pod. Inside the pod, the peas, which are the seeds, grow until they are as big as the peas you eat. If they are left on the plant until they are mature, the peas can be planted to produce a new plant.

When we grow peas, we pick the pods off the plants and remove the peas from the pods to eat. This is called shelling peas. Most of us eat peas raised on farms which are frozen or canned at processing plants.

You can observe part of the life cycle of a plant by sprouting pea seeds in your own classroom!



Adapted with permission from ''New York Is Growing.''

The Chicken and the Egg

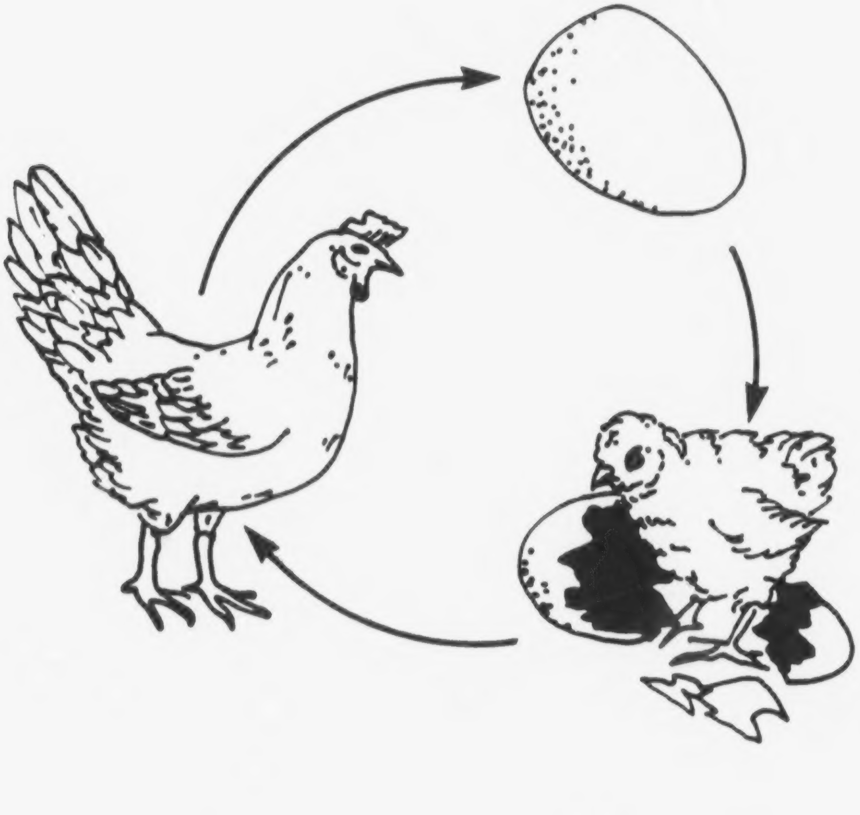
Do you know what a life cycle is? It is the stages a living thing goes through. For example, a chicken goes through three stages.

Do you see how the cycle goes on and on? An adult chicken lays an egg that contains everything needed to make a new chick. The egg hatches a baby chick, the chick grows into an adult chicken, the adult chicken mates and lays more eggs...

Every living thing has a life cycle. The life cycle of every organism is important because that is how we keep having more of that organism.

But, the life cycle is important in other ways also. Let's think about agriculture. We eat plants and animals at different stages in their life cycle. Look at the life cycle of the chicken again. A hen (female chicken) can lay a lot of eggs in her lifetime. Some eggs are hatched to provide more chickens but, on most farms, chickens are raised just to produce eggs for us to eat. On other farms, young chicks are raised for about 8 weeks, until they weigh 3 ½ pounds. These chickens, called broilers, are the chickens we usually eat.

You may want to hatch some eggs in your classroom to see for yourself part of the life cycle of a chicken.

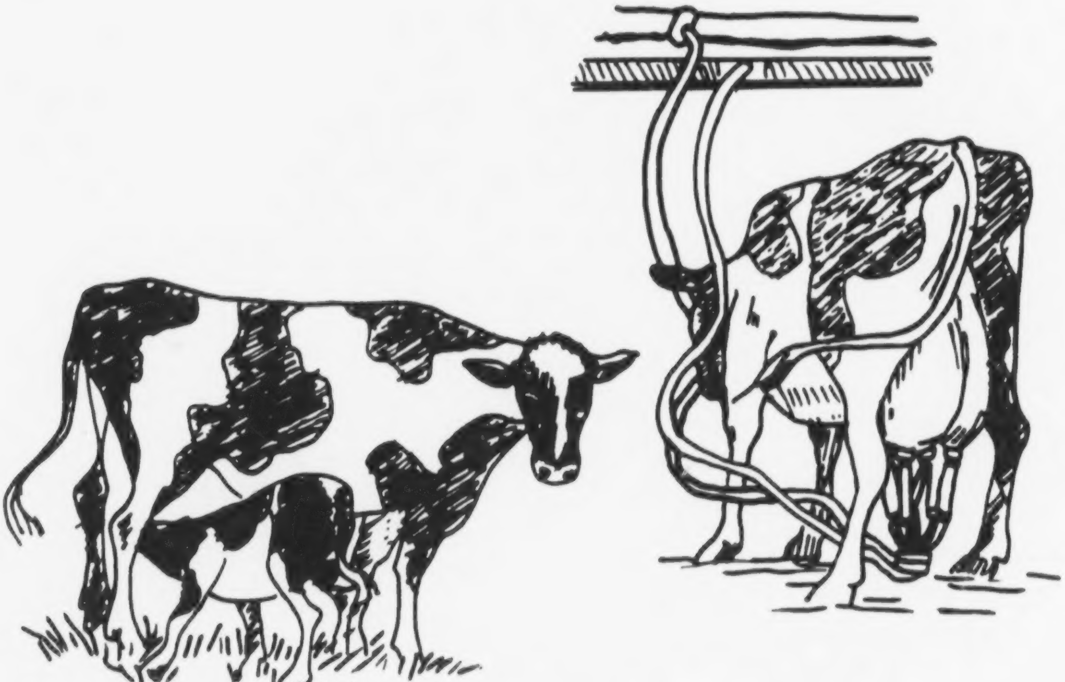


Adapted with permission from "New York Is Growing."

Cows, Calves and Milk

The life cycle of a cow is important in providing us with milk. A cow is a mammal, which means it gives birth to a calf and the cow's body produces milk for the calf. The cow will continue to produce milk if she is milked regularly. The amount of milk a cow gives would eventually drop off (dry up), or stop being produced, if she didn't have another calf.

On dairy farms, each cow is bred (the egg in her body is fertilized) every year, and the egg produces a calf. Then the cows are milked every day, and their milk is sold. Milk can be made into cheese, butter, ice cream, yogurt or simply sold as milk. You can see how important it is to farmers to understand the life cycle. You can also see how important it is to all of us! We all depend upon the life cycle of plants and animals to provide us with food and other things we need.



Adapted with permission from "New York Is Growing."

Interested in Hatching Chicks? Here's How

Equipment

To hatch eggs you need an incubator. An incubator is simply an insulated container with a heating element and a regulator that keeps a constant temperature of 101° to 103°F.

You can construct an incubator from a few scraps of plywood, or use a cardboard box, or make a superior insulated incubator from a styrofoam picnic cooler. Plans for building incubators are available from your County Extension Agent.

If you intend to make hatching eggs an annual project, consider buying a commercially manufactured electric incubator. They are available in a wide variety of sizes and models at reasonable prices. Factory-built incubators may be purchased at most farm stores or from farm mail-order catalogs.

Buying Hatching Eggs

The eggs you buy from grocery stores are probably infertile so they will not hatch. Locate a farmer in your area that sells fertile eggs, or buy the eggs from a local hatchery. Hatchability declines if the eggs are more than 7 days old so insist that the eggs be fresh. If possible, pick the eggs up yourself rather than have them shipped or mailed.

Care of Eggs Before Incubation

Extreme care must be taken with the eggs before actually placing them in an incubator. If it is necessary to hold the eggs a few days before you ''set'' them, store them in a place where the temperature is about 50°F and the humidity is 70 to 80 percent. (Use the vegetable drawer of your refrigerator, for example, if the temperature does not fall below 40°F. Turn the eggs daily.

Location of the Incubator

Place the incubator in a room where the temperature is between 70° and 75°F and is free of drafts and excessive variations in temperature. Avoid placing the incubator near windows where direct rays of the sun may come in contact with the unit — raising the temperature and destroying the hatching embryos. A basement or cellar room away from central heating is excellent. Such places also have the necessary humidity needed to hatch the eggs.

Preparing Incubator for Operation

Before setting the eggs, plug in the incubator for a few days to see if it is working properly. Most incubators have a water pan under the wire rack at the bottom of the unit. Fill the water pan with warm water and regulate the temperature to stay between 101° and 103°F.

In a factory-built unit, the temperature is regulated simply by adjusting the thermostat. In a cardboard box or styrofoam container, adjust the wattage of the light bulb that is being used as a heating element. (Most homemade units require a 40-watt light bulb.) When building a box incubator, avoid putting the light bulb close to the incubator walls to reduce fire hazard.

Humidity

The water pan at the bottom of your incubator should be kept filled during the entire hatching period. Use warm water; hot or cold water will affect the temperature of the incubator. The humidity is required to keep the eggs from drying out and causing the chickens to die.

Temperature

Keep a thermometer in the incubator and maintain a temperature of 101° to 103°F. Variations from 99° to 104°F will reduce the hatch somewhat, but will not cause great harm.

Turning the Eggs

Place the eggs on their sides in the incubator trays. Turn them three times a day. (A good way to determine if an egg has been turned is to place a mark on one side.) Turning eggs prevents the embryo from sticking to the shell membrane. Turning serves another purpose: eggs require a cooling period each day to improve hatchability. (Turning and cooling are accomplished naturally when setting hens hatch chicks.) The hen leaves the nest to eat, then inspects the eggs by rolling them around when she returns to the nest.

Testing the Eggs

Although it is not necessary to test the eggs for fertility, removing the infertile eggs that will not hatch does make more room in the incubator.

Cull out the unhatchables by "candling." This can be done after the fourth or fifth day of incubation when it is possible to see the developing embryo.

Make a "candler" by cutting 1-inch-diameter holes in both ends of a shoe box or a similar box. Using an extension cord, mount a 60-watt light bulb in one end of the box. Darken the room and hold an egg outside the opening at the opposite end of the box. The egg will be illuminated from behind, and you can actually see the chick developing. It will be difficult to see any development until the fourth or fifth day of incubation.

When you are able to see a pinkish color, this means that the embryo is alive and circulation is established.

If the embryo is not alive, the contents of the egg will appear muddy or brownish. Such eggs should be removed from the incubator.

Final Stages of Incubation

Chicken eggs take 21 days to hatch. The incubator should not be opened after the 17th day, so make sure all water pans in the incubator are filled.

Some chicks may start pecking their way out of the shells as early as the 19th day – others may not appear until the 22nd day. But generally, most of the healthy chicks will emerge by the 21st day.

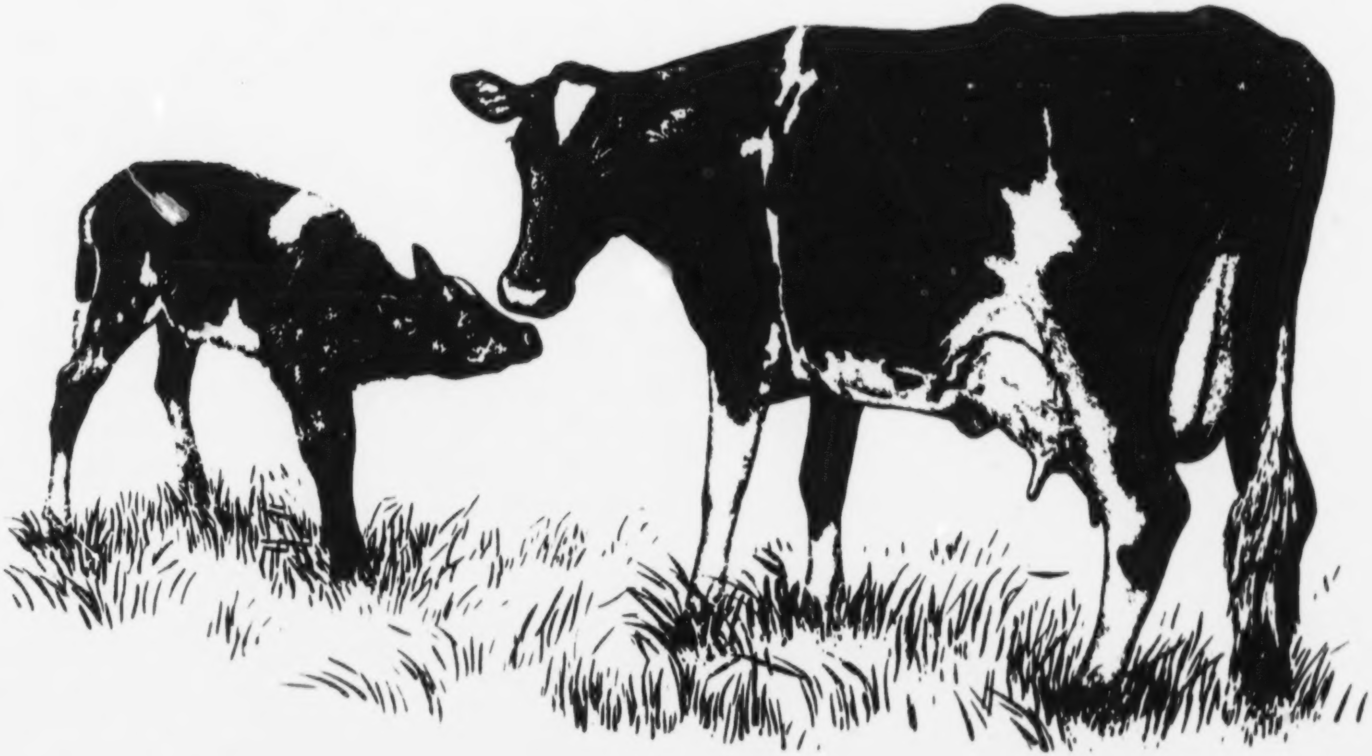
After most of the chicks are hatched. lower the temperature to about 95°F. Open the vents on commercially built incubators to permit better air circulation so the chicks will dry. (Most building plans for homemade units will instruct you.)

Incubation Periods

Chicken eggs require 21 days to develop, but the incubation period of other species of poultry varies. Here is a listing of approximate incubation periods.

Species	Days
Goose	29-31
Turkey	28
Pheasant	23-24
Quail	23
Duck	28
Guinea	26-28
Pigeon	16-18

Reproduced with permission from "Farm in the School" Teachers' Resource Guide, Illinois Farm Bureau.



Name ______________________

Life Cycle — What Have You Learned?

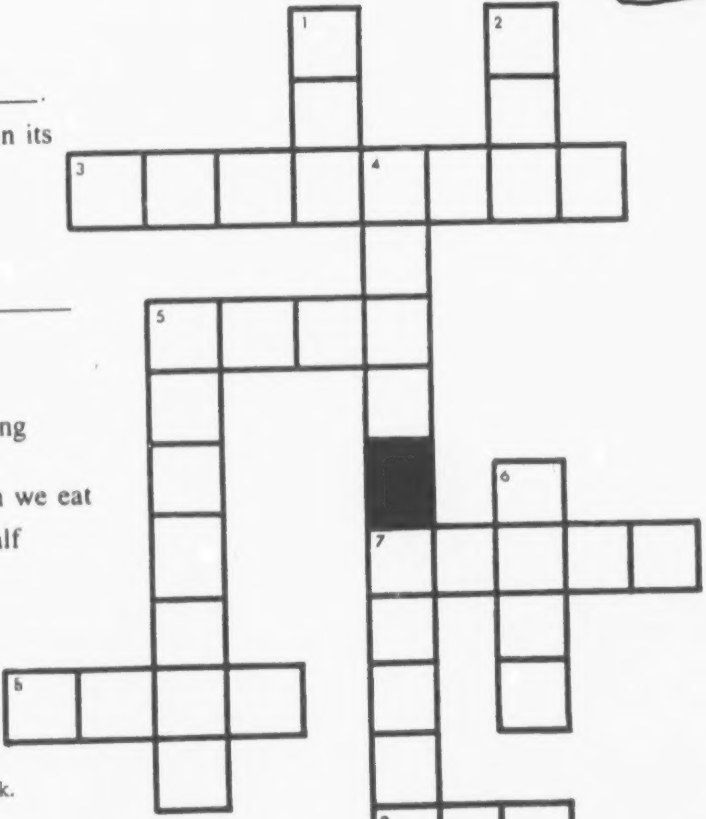
1. What is to be found in an egg?
2. Why is it necessary for organisms to have a life cycle?
3. What if:
   a. A hen layed only one egg?
   b. Chickens never stopped growing?
   c. You never stopped milking a cow?
   d. You milked the cow only every other day?
   e. All milk was used in cheese?
4. How is the pea blossom fertilized?
5. What if:
   a. the pea blossom was not fertilized?
6. What is meant by shelling peas?

Across:

3. A young pea plant
5. A young cow
7. A young chicken
8. A pea is a ______________________.
9. What follows an adult chicken in its life cycle?

Down:

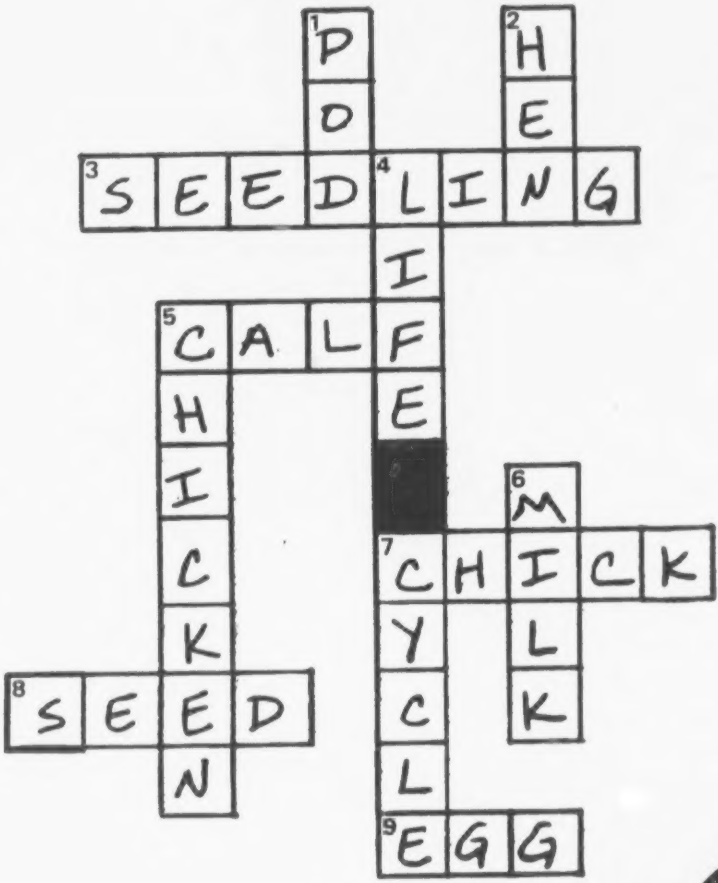
1. Peas are removed from the ________ when they are shelled.
2. A female chicken
4. & 7. All the stages a living thing goes through (2 words)
5. An animal that lays eggs which we eat
6. A cow produces this for her calf



Adapted from "New York Is Growing," New York.

Life Cycle Key — What Have You Learned?

1. Yolk, white and, if fertilized, an embyro that contains everything needed to make a new chick.
2. In order to have more of that organism.
3. These are creative thought provoking questions. A variety of answers is possible.
4. The flower has both female (ovum) and male (pollen) parts. The pollen fertilizes the ovum.
5. No new pea would develop if no fertilization occurred.
6. Removing the peas from the pod.


1 POD
2 HEN
3 SEEDLING
4 LIFE CYCLE
5 CALF
5 CHICKEN
6 MILK
7 CHICK
8 SEED
9 EGG

Adapted from "New York Is Growing," New York.

Plants
Unit 13

Biotechnology in Agriculture

Teacher Background — Biotechnology

In this century, agriculture in the United States has experienced two powerful changes. In the 1930's powered farm equipment ushered in the **Mechanical Era** in agriculture. Our productivity shot up in response. In the 1950's, the advent of powerful and effective agricultural chemicals initiated the **Chemical Era**. Again, our productivity increased tremendously. Now we're approaching the 1990's and we're about to enter what could be the most important era of all for agriculture: the **Biological Era.**

The Biological Era is coming about through the power of agricultural **biotechnology**. It has been only 10 years since the word "biotechnology" was coined. The "bio" part referred to life processes; the "**technology**" tacked on the end referred to a diversity of tools and techniques that could be used to achieve a particular purpose. Together, the newly pieced together word meant "the use of living organisms to make commercial products."

Biotechnology is simply a collection of old and new technologies or tools that allow us to purposely rearrange the genetic makeup of organisms. In other words, science is now enabling us to build better biological systems. The Biological Era will be characterized by increased productivity just like the previous two eras. But it will also be characterized by the increased quality and diversity of the products we produce for consumers.

What's in it for Agriculture?

What's in it for agriculture? In two words, "our future." Farming is a risky business. Biotechnology can help tip this balance of risk in favor of the farmer. Every area of agriculture will be affected.

These new technologies will enable farmers to produce crops that are resistant to drought, frost, salt and heat; resistant to plant diseases and insect pests; resistant to environmentally safe herbicides; and able to fix their own nitrogen. These breakthroughs should reduce our dependency on agricultural chemicals. Biotechnology will also allow us to increase the nutritional content of our produce, improve its taste and appearance and enhance its keeping qualities.

Animal health care products will include safer and more effective vaccines with longer shelf lives, better methods of improving disease resistance and **diagnostic** kits that can be used on the farm.

Animal productivity will be enhanced through the use of products that increase the rate of growth, control leaneness, increase feeding efficiency and stimulate the immune system.

Reproductive biology of farm animals will be advanced through improved uses for artificial insemination, techniques for synchronizing estrus, embryo transplants, embryo sexing and cloning techniques. The following information are examples of future agricultural products produced through biotechnology.

Plants:

1. Popcorn that tastes like it has been buttered.
2. Carrots and celery that are crunchier and sweeter.
3. Tomatoes that are higher in pulp and redder and better for canning and making thicker ketchup.
4. Corn, soybeans and cotton that are insect resistant. Insects that try to nibble on these plants will sicken and die.
5. Corn with ears that are easier to harvest.
6. Crop plants that don't use as much water.
7. Crops that don't freeze as easily.
8. Soybeans and corn that are higher in protein and more nutritious for animals and consumers.
9. Crops that are resistant to weed killers that are safe to use in the environment. Currently, farmers have to use some herbicides that can sink into the soil and get into the groundwater. If we can use herbicides that break down more rapidly without damaging our crops, we can stop polluting our water.

10. Crops that use less fertilizer.
11. Traditional crops such as soybeans that produce entirely new products such as industrial lubricants, cosmetics and protein **pharmaceuticals** (e.g. insulin, blood clotting factors, interferon).

Animals:

1. Easy-to-use kits for the farmer that can be used to spot animal diseases before the animal gets really sick (diagnostic kits — very rapid, inexpensive and sensitive).
2. Vaccines that are safer, more effective and easier to use than conventional products. They will protect our animals from many diseases that now kill them.
3. Growth hormones (genetically engineered proteins) that may increase milk production in cows, reduce fat in hogs and allow chickens and turkeys to grow faster.
4. Products to allow our animals to use their food more efficiently. For example, cows have four compartment stomachs and their food is broken down and digested for them by microbial organisms (**microbes**). Right now, cows use less than half of what they eat. We can make those microbes become better at what they do so the cow can eat half as much and still grow as fast.

Help for the Environment:

1. Biotechnology will allow us to reduce our use of agricultural chemicals. Our plants will be resistant to certain insects. They will require less fertilizer. And we will be able to switch to safer herbicides.
2. Biotechnology will help us save endangered species. We are making rapid advances in reproductive biology so that we may be able to save animals like the Siberian tiger, and hopefully, the panda bear.

The Biological Era is well underway. Biotechnology research is widespread and worldwide. It could provide our farmers with the competitive edge they need in world markets — but only if we, as a nation, commit ourselves to making the agricultural applications of biotechnology a national priority.

The Future of Biotechnology

As we enter the Biological Era, what can farmers expect? Biotechnology products will be affordable. This technology is "**scale-neutral**." It will be equally available to small and large farmers because of the small capital investment required. It will allow for more efficient agricultural systems. It also will mean that the good managers, the ones that can successfully incorporate the new products into their current management systems, are the ones who stand to profit. As with all technologies, the early adopters will make the most money.

The emphasis in agriculture will change from yield to quality. There will be more opportunities to grow new crops. There will be more diversity in what we grow. And there will be new uses for agricultural products besides just food and fiber.

There will be more **integration** up and down the food chain and more restructuring altogether. For example, dairy farmers will work more closely with processors and with consumers. Finally, the introduction of new products will be gradual, giving farmers time to adjust and adapt the new products to their management systems.

The Bottom Line

Last year, the former president of the University of Georgia, Dr. Fred Davison, was asked about biotechnology. He replied, "I believe that biotechnology presents to us today opportunities that are so great that we cannot conceive what those benefits might be. We can only begin to see some of the implications." He went on to add that the age of biotechnology "can be the most exciting period, in my estimation, in recorded history. I think, personally, it will be."

Biotechnology may have a greater impact on agriculture than any technology that has gone before it. It's about time farmers got some good news for a change.

Adapted with permission from Dr. A. Ann Sorensen, assistant director, Natural & Environmental Resources Division, American Farm Bureau Federation, Park Ridge, IL 60068.

Student Background — Biotechnology

Three important changes have occurred in agriculture in this century:

1. **Mechanical Era** (1930's) — Introduction of powered farm equipment.
2. **Chemical Era** (1950's) — Widespread use of effective agricultural chemicals.
3. **Biological Era** (1990's) — Increased production and quality of plants and animals.

The term **"biotechnology"** means using knowledge acquired in scientific laboratories and applying it to agriculture. Bio: life processes. Technology: use of a variety of tools and techniques to achieve a particular purpose. Biotech: collection of old and new **technologies** or tools which allow change in the way living things are grown.

Through the use of biotechnology, the future of agriculture will change in favor of the farmer. Every area of agriculture will be affected.

Farmers will be able to produce higher quality crops because frost, salt and heat will not dry out plants. Farmers will not need to depend on agricultural chemicals because plants will have built in resistance to disease and insect problems. Crops will be nutritious; they will taste better, look better and keep fresher longer.

Biotechnology will improve quality among animals too. Animal vaccines will be safer because they will have a longer shelf life and will be more effective. Animals will give birth to more young, and the offspring will grow faster, have less body fat and will have immunity to disease.

Here are examples of future plant products that will result from the use of biotechnology:

- Popcorn that tastes like it has been buttered.
- Carrots and celery that are crunchier and sweeter.
- Tomatoes that will have more pulp, more red color and will be better for canning and making ketchup.
- Ears of corn that are easier to harvest.
- Corn, soybeans and cotton that are insect resistant. Insects that nibble on them will get sick and die.

Other characteristics of plants will be:

- Plants will need less water, less fertilizer and will have more resistance to freezing.
- Feed crops like soybeans and corn will be more nutritious for animals and consumers.
- Plants will have more product uses like cosmetics and drugs.

Animal products will be developed from biotechnology:

- Higher volumes of milk will be produced by cows.
- Hogs will be leaner.
- Chickens and turkeys will grow faster.
- Use of vaccines will make animals healthier.
- Farmers will recognize more quickly when an animal is sick and when to provide care.
- Animals will eat less food but grow faster.

Biotechnology will be beneficial to the environment too:

- Our use of agricultural chemicals will be less, and the herbicides farmers use will be safer.
- Plants will be naturally resistant to certain insects.
- Less fertilizer will be needed to help crops grow.
- Endangered species like the Siberian tiger and the panda bear may be less threatened because of improved reproduction.

Products that result from biotechnology will be relatively inexpensive. Both small and large acreage farmers will be able to afford these products. Good farm managers will be able to make more money because the products they grow will have better quality, and new products other than food and clothing will be produced.

Other countries are starting to use biotechnology. Japan, France, Germany and Great Britain are developing new products.

Among the three major changes that have occurred in agriculture this century, biotechnology will give the most benefits to agriculture, farmers and mankind.

Lesson: **Biotechnology in Agriculture**

Resources:

Newspapers and magazine articles about biotechnology, resource person knowledgeable on biotechnology, reference materials teachers may locate in the library.

Premise:

Biotechnology is an emerging tool in agriculture which allows us to purposely rearrange the genetic make-up of organisms. Scientists all over the world will continue to try and understand how biological systems work.

Objectives:

Students will recognize that biotechnology is and will be important to agriculture in Ohio and the rest of the world. In particular, they will be able to:

1. Define "Biotechnology."
2. Give one example each how biotechnology can improve animal and plant organisms.
3. Explain where the biotechnology research process takes place (i.e. in the laboratory by research scientists).

Motivation:

Ask students if they have ever heard of biotechnology.

1. How many know what genes are in reference to animals and plant reproduction?
2. What happens when a farmer can increase milk production with less feed?
3. What does a biological scientist do?

Ag Unit: **Food & Fiber Core**

Major: **Science**

Minor: **Language Arts**

Related Lesson Plans

The Start of Life — Life Cycle

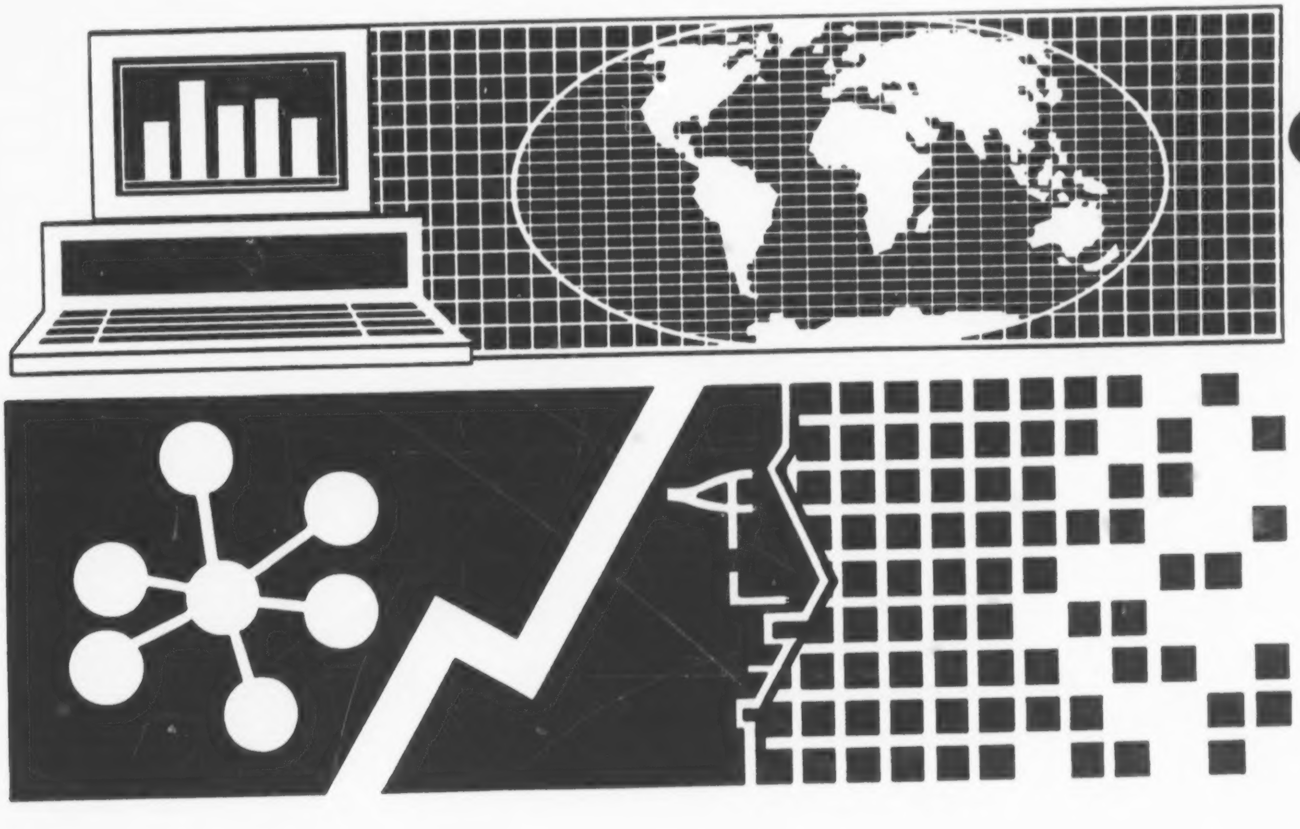
Remarks/Notes

Vocabulary:

1. Biotechnology – the use of living organisms to make commercial products. Simply a collection of old and new technologies or tools which allow scientists to rearrange the genetic makeup of organisms
2. Mechanical Era – a period (1930's) of time when production of agricultural products was increased when farmers used powered farm equipment instead of horsepower
3. Chemical Era – in the 1950's when farmers used fertilizers, herbicides, and pesticides to increase the efficiency of the production of farm products
4. Biological Era – the term used to define the advent of the biotechnology (1990's) being used to increase quality and diversity of agricultural products
5. Scale-neutral – terms used to indicate that something affects both small and large farmers, not just one or the other
6. Integration – to bring (parts) together into a whole
7. Technology – applied science
8. Diagnostic – the act of deciding the nature of a disease by examination and analysis
9. Pharmaceutical – of pharmacy or drugs
10. Microbe – a microorganism (microscopic animal or vegetable organism (i.e. bacteria, protozoan, virus)

Trivia:

1. In 1988, experts felt the United States had the lead in about 80 percent of the whole biotechnology area.
2. Four other countries have made biotechnology a national priority. They are Japan, Germany, France, and Great Britain.
3. Embryo transplants used to cost $2,000 each. Now, 10 years later they are in the $200 price range. Biotechnology will become affordable.



Suggested Activities:

1. Invite a resource person to class who may have some knowledge about biotechnology. An example might be a biology teacher, agriculture education instructor, Extension county agent or a researcher. Allow students to ask questions and discuss.
2. Newspapers and magazines have numerous articles about biotechnology. Have students search for an article at home and bring it to school to discuss.
3. Have students research an article in the library and bring it to class to discuss it.
4. The teacher can give examples of how the researchers are currently using biotechnology in agriculture from the background information or other sources. Have students brainstorm other ways biotechnology might be used.
5. Exercise 1 : The Power of the Microscope (page 8) – Follow procedures as outlined on the procedures sheet.
6. Exercise 2: Growing Microorganisms (page 9) – Follow procedures as outlined on the procedures sheet.
7. Exercise 3: Making Your Own Yogurt (page 10) – Follow procedures as outlined on the procedures sheet.

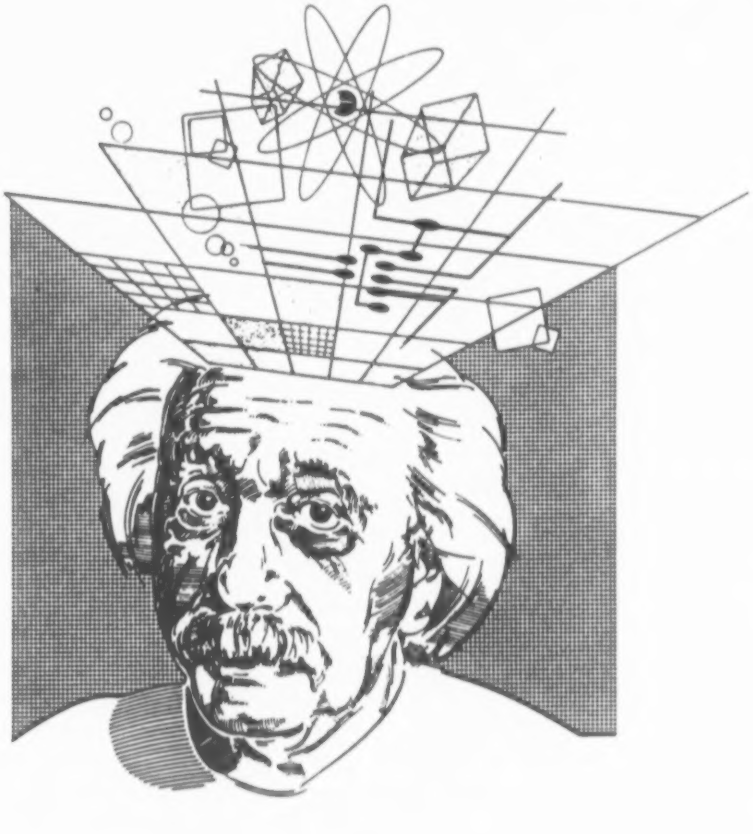
Exercise 1: The Power of the Microscope

Premise:

Biotechnology makes use of microscopic organisms (bacteria, yeasts and molds) called microorganisms. This exercise will allow students to see a microorganism using a microscope.

Procedure:

1. If a microscope is not available in your elementary school, you may want to contact a biology/science teacher in the junior/senior high school as a resource person to assist in this exercise. Possibly a qualified senior student could be an effective resource person.
2. Observe a living specimen. Examples of these are: Baker's yeast or pond water.
3. Prepare a slide to be observed. Place some yeast cells in a few drops of water on the slide and put a cover slip on top. Then allow students to observe with the naked eye. Ask them if they think anything is on the slide.
4. Prepare a slide under the microscope lens. Locate the specimen and then allow students to look. Assist the students in focusing the microscope. Encourage students to keep both eyes open at all times when looking through the microscope.
5. Stress with the students that scientists working in biotechnology use microorganisms as a way to improve agricultural products.
6. Encourage students to ask questions.



Exercise 2: Growing Microorganisms

Premise:

Biotechnology relies on the student working with microorganisms. We share our environment with various and diverse microorganisms. The purpose of this exercise is to allow the student to observe the existence of microorganisms in everyday life.

Materials needed:

- Sterile agar petri plates
- Yeast from store
- Moldy cheese
- Garden soil
- Pond water
- Ditch water

Source: Check with your high school science department OR order from:

Ward's Natural Science East Coast Facility
5100 West Henrietta Road, P.O. Box 92912
Rochester, NY 14692-9012
Ph: 1-800-962-2660

In Ohio contact:
Jerry Tschudi
Ph: (419) 947-9195

Procedure:

1. Obtain sterile agar petri plates and carefully label them with name, date, experiment and any other pertinent identification information. Do not open the lid.
2. Expose the petri dish of agar medium to microorganisms by performing one of the following:
    a. Sprinkle some yeast on the medium using a small spatula.
    b. Using a cotton swab, rub across mold on cheese then rub on the medium in the petri dish.
    c. Using an eye dropper, deposit a drop or two of pond water/ditch water onto the medium in the petri dish.
    d. Rub your finger (after washing hand thoroughly) on your face and then rub same finger on medium in petri dish.
    e. Place strand of hair on the medium in petri dish.
    f. Others.
3. Seal petri dishes with clear tape.
4. Place the petri dishes in a drawer overnight and observe the next day and after 3 and 7 days. Have students write on a piece of paper what they observed on each petri dish.
5. After incubation, observe the types of microorganisms that have grown on the surface of the plate. Many microorganisms will have formed visible colonies. A colony is a group of microbial cells resulting from the reproduction of one or more cells that were deposited on the medium surface and grow into a visible collection of cells.
6. Discuss with students what took place in the petri dishes.

Exercise 3: Making Your Own Yogurt

Introduction:

An example of a microbial process similar to those used by the scientist working in the biotechnology field is the process using bacteria to make yogurt. Yogurt is a form of sour milk. Originally prepared from whole milk boiled down to half its volume, yogurt can also be made by adding dry-milk solids to boiled milk to achieve a custard-like consistency. Two microscopic bacteria used as starter cultures are *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. Large amounts of these bacteria are inoculated into the milk, and lactic acid develops rapidly. Evaporation thickens the yogurt and some proteins coagulate under the acidic conditions. In a few hours the yogurt is ready for consumption.

Materials needed:

1 quart milk
1 cup powdered milk
⅓ cup unflavored commercial yogurt
fresh or frozen fruit (option)
1 cooking thermometer
small containers (styrofoam coffee cups) with lids (old cottage cheese or yogurt containers would also work)
small cooler

Procedure:

1. Heat 1 quart of milk to about 170°F, stirring often and using a thermometer to check the temperature.
2. Let the milk cool to about 130°F then add 1 cup of powdered milk and ⅓ cup of unflavored commercial yogurt. This yogurt serves as the source of the bacteria necessary for the process to take place (fresh or frozen fruit may be added).
3. Mix thoroughly and pour into small containers with lids. Be sure to have students observe the liquid at this stage.
4. Use a small cooler for the incubation step. Fill the cooler with several inches of water at 130°F.
5. Place the containers of the mixture in the cooler, close the lid tightly, and let the containers stand for 6 to 8 hours.
6. During this time bacteria will multiply and yogurt will thicken. Refrigerate and enjoy.
7. You may want to purchase some yogurt and compare tastes.

Summary:

Discuss with the students that the microscopic bacteria were at work for the 6 to 8 hours, multiplying and causing the mixture to thicken. Explain that scientists use this process extensively in biotechnology when they multiply microorganisms using flasks and petri dishes in the laboratory.

Source of recipe was the Fundamentals of Microbiology, 2nd Edition, I. Edward Alcamo, Benjamin/Cummings Publishing Co., Inc., Menlo Park, CA.

Name ________________________

Biotechnology — What Have You Learned?

Please answer the question based on the information presented in class.

1. There were three eras of agriculture the United States has experienced in the last 50 years. Which era is agriculture entering in during the 1990's (today)?
    a. Chemical era
    b. Mechanical era
    c. Biological era
    d. Animal era

2. Define biotechnology.

____

____

3. Give an example of how biotechnology can improve an animal.

____

____

4. Describe how biotechnology can improve a plant.

____

____

5. Describe in your own words the place a scientist would work in trying to discover ways to improve animals and plants using biotechnology.

____

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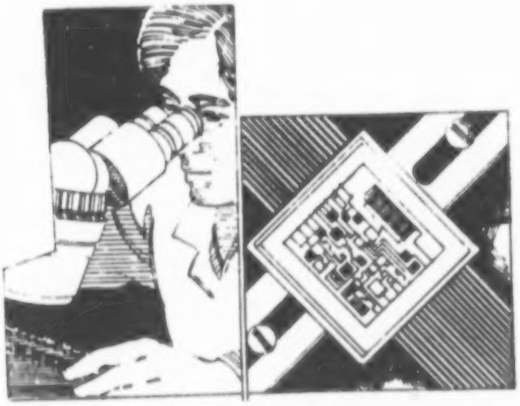


Biotechnology Key — What Have You Learned?

1. c. Biological era
2. The use of living organisms to make commercial products.
3. Answers will vary
4. Answers will vary
5. Description of a typical laboratory — answers will vary.

Micronutrients

Micronutrients — Background

A variety of foods gives us the necessary vitamins and minerals for a healthy, growing body. All the foods we eat come from the soil. Even the sea food we eat comes directly or indirectly from the land.

Plants need **nourishment** too. They change their food into fruits, vegetables and plants for us to eat. We get our nourishment from these plants. These life-giving foods for plants are called **nutrients.**

A nutrient called **nitrogen** is **released** into the air by lightning. Nitrogen enters the soil during a lightning and thunder storm.

Another important nutrient is **calcium**. Your body gets the calcium it needs from the dairy foods you eat. Calcium makes strong bones and teeth.

Sodium is another nutrient we get from the salt we eat. It can be found in dry lake beds, underground and in seawater. Sodium makes the **cells** in our bodies live and work. Sodium is not required by plants.

Your body also needs nutrients in smaller quantities. These are called **micronutrients**. Micro means small. If a plant gets too many micronutrients, it will die. It will also die if it doesn't get enough.

Plants get micronutrients in **fertilizers**. These are put into fertilizers in very small quantities.

Micronutrients help us in different ways. They help to make sugar in plants. Vegetables such as corn taste sweeter to us because the micronutrients in the plant cause sugar to be released.

Plants can be **pollinized** easier. Cherries and apples grow thicker on the trees. Seeds develop properly to make perfect new plants or fruit. Plants are greener because **chlorophyll** is present. Flavor and color of fruit is better.

Micronutrients help plants to breathe properly. They take in the **carbon dioxide** we **exhale** and give us oxygen to breathe in. A tree or plant that has healthy leaves and stems will produce more and better fruit, vegetables, flowers and shade.

A lack of the micronutrient called **boron** causes beans to turn yellow and stop growing. This yellowing is called **chlorosis**. Chlorosis means absence of green. Heads and stems of cauliflower turn dark brown. Celery leaves turn brown and spotted.

Fruits such as apples and apricots do not bloom properly and blossoms do not stay on the trees. We call it "blossom drop." If the fruit does appear, it may be small and **deformed** with cracks in the skins. Shoots or new growth on many plants will die back.

New corn leaves stick together and will not open to the sun. New leaves cannot grow. Tomatoes and peppers get blossom rot and the blossoms fall off. Without blossoms there can be no tomatoes or peppers. Carrots will develop hollow hearts and turn dark inside.

A lack of another micronutrient called **iron** causes young leaves to turn yellow between the veins. Fruit such as strawberries do not have a shiny, bright skin and will become soft. If fruits and vegetables show extreme yellowing of their foliage, the crop will not bring top prices at the market. Spraying the leaves with the right amounts of micronutrients seems to be the best treatment.

Another way to tell if a plant is lacking in micronutrients is to sample the soil in a lab. Your county extension agent can help you find someone to sample the soil. If the soil shows a deficiency, it will need to be **treated**.

In the early days of farming in Ohio, your great-grandfather used natural fertilizers from his dairy or cattle **operations** to fertilize his fields. Any type of natural fertilizer, or manure, was very good for the soil because it provided **humus** as well as nutrients. Humus is that substance made up of dead leaves, stems, straw or other organic matter. It may be rotted or digested by the animals. Humus keeps the soil loose and it is easy for the water to soak in. However, as the years went by, more nutrients were taken out of the soil by growing plants, and **production** went down.

When the nutrients **decreased**, production dropped. The **chemical** companies sold the farmers the needed fertilizers. Production again soared.

Another reason for the **decline** in **available** plant food was that farm sizes were **reduced** when the cities and highways took up so much of the good land. Farmers had to produce more crops on the remaining land. The supply of nutrients was eventually used up.

A decline in nutrients also came when the land was leveled so that it could be farmed and irrigated more easily. The leveled land was smooth, but the scraping and rearranging of the soil left many areas with a very thin layer of topsoil. Only heavy fertilization and added humus could bring the land into top production again.

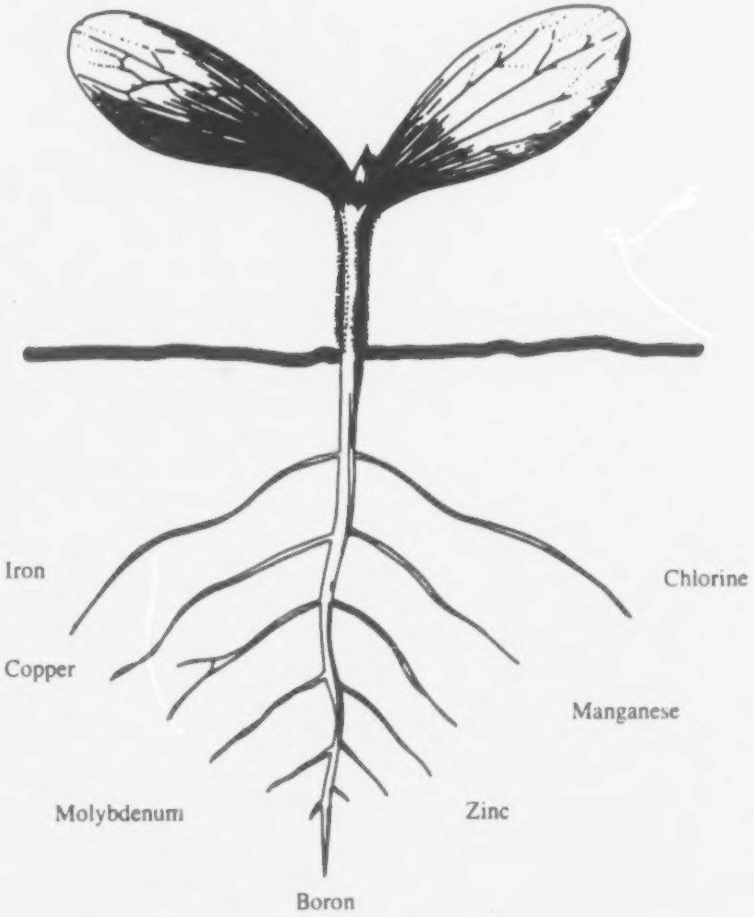
Another problem arose when farmers were careless when they irrigated. The use of too much water **eroded** or washed away the topsoil. It flowed right along with the wasted water into drains and back into the rivers and finally into the ocean.

Another reason for the decline in nutrients is that many farms are worn out. This is true in some places in the eastern United States. The same crops have been planted in the same fields year after year and the nutrients have been used up.

A way to correct this problem and rebuild the soil is by crop **rotation**. Alfalfa, peas, beans and other types of legumes add nitrogen and nutrients to the soil without taking any out. By rotating or trading the growing of legumes with corn or grain, soil can continue to produce quality crops.

In your garden it is a good idea to rotate your vegetables. The soil does not wear out so fast, and diseases are kept to a minimum.

Can you see from this study that supplying nutrients for plants is as complicated as supplying nutrients to and for your family? In feeding the plants the farmer is feeding the world! The farmers in your area will have special needs in growing the crops that grow best there, but one thing is certain, every plant needs food!



Name ______________________

Micronutrients Pictures

The pictures on these pages are numbered. Match each number with the part of the background lesson it best fits. Use a colored pen or pencil so that your choices will show. For example, #1 belongs on page 2 with the pollination text because the word "cherries" is mentioned here. #2 belongs with the text about "blossom drop" because the picture shows this. When finished color your picture the way they would look as described in the text.

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
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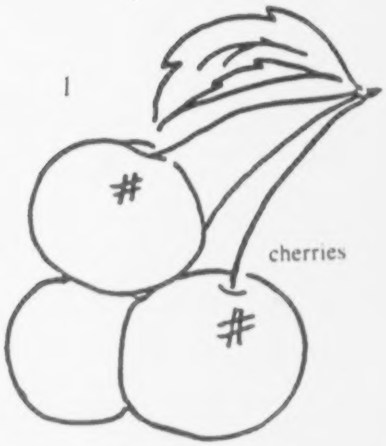
17. ______________________

1



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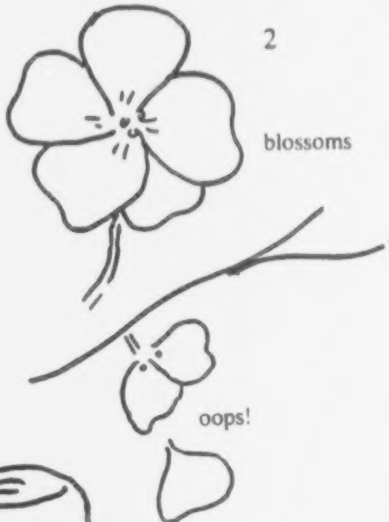
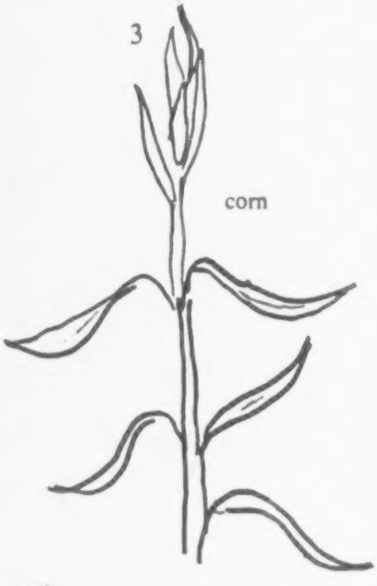

blossoms
oops!

3



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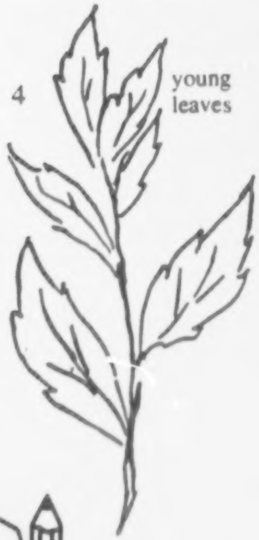
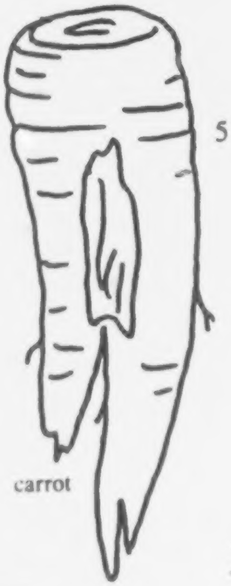

young
leaves

5



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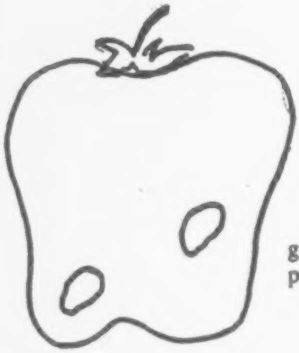
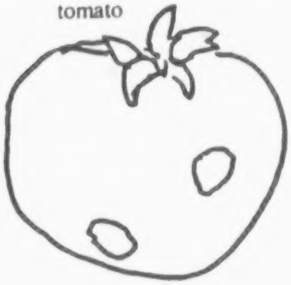

green
pepper

7



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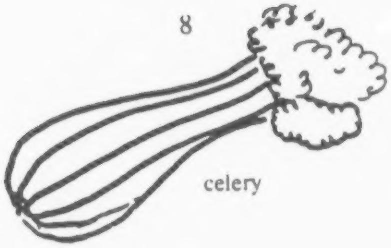

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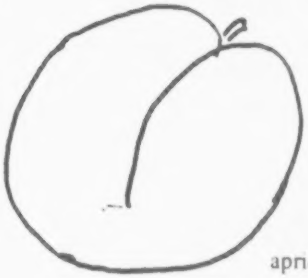

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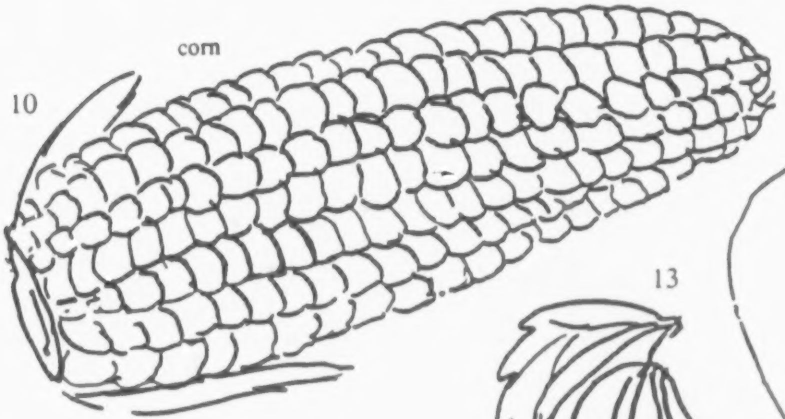

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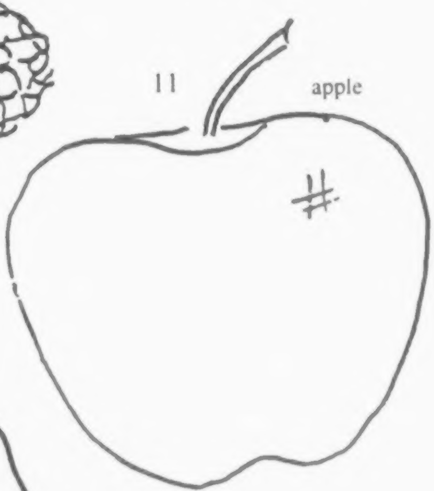

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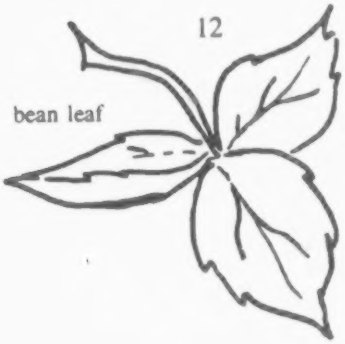
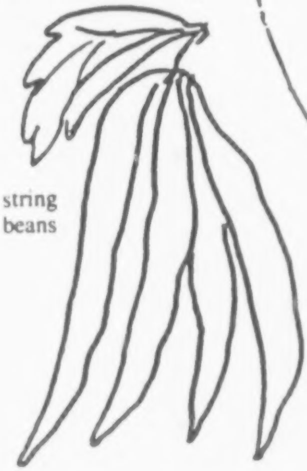
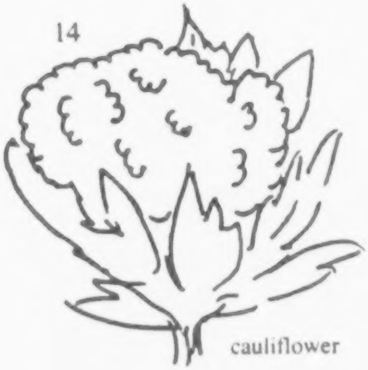


13


string
beans

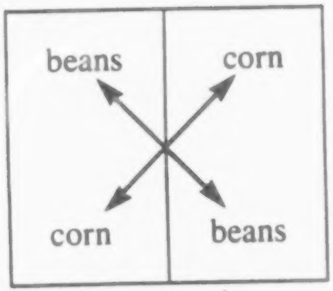
14


cauliflower

15

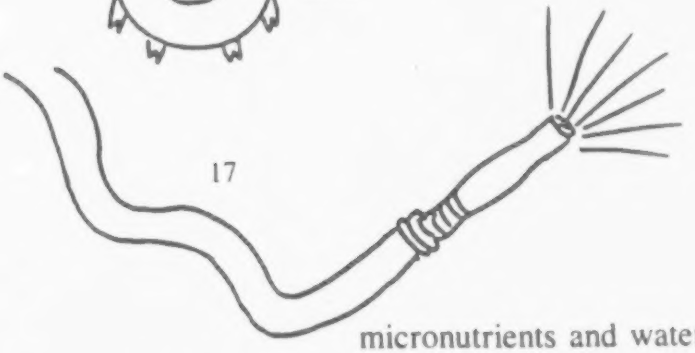
stock
farms

16


beans
corn
corn
beans

Crop rotation

17


micronutrients and water

Micronutrient Picture Key

A variety of foods gives us the necessary vitamins and minerals for a healthy, growing body. All the foods we eat come from the soil. Even the sea food we eat comes directly or indirectly from the land.

Plants need **nourishment** too. They change their food into fruits, vegetables and plants for us to eat. We get our nourishment from these plants. These life-giving foods for plants are called **nutrients.**

A nutrient called **nitrogen** is **released** into the air by lightning. Nitrogen enters the soil during a lightning and thunder storm.

Another important nutrient is **calcium**. Your body gets the calcium it needs from the dairy foods you eat. Calcium makes strong bones and teeth.

Sodium is another nutrient we get from the salt we eat. It can be found in dry lake beds, underground and in seawater. Sodium makes the **cells** in our bodies live and work. Sodium is not required by plants.

Your body also needs nutrients in smaller quantities. These are called **micronutrients**. Micro means small. If a plant gets too many micronutrients, it will die. It will also die if it doesn't get enough.

Plants get micronutrients in **fertilizers**. These are put into fertilizers in very small quantities.

Micronutrients help us in different ways. They help to make sugar in plants. Vegetables such as corn (10) taste sweeter to us because the micronutrients in the plant cause sugar to be released.

Plants can be **pollinized** easier. Cherries (1) and apples (11) grow thicker on the trees. Seeds develop properly to make perfect new plants or fruit. Plants are greener because **chlorophyll** is present. Flavor and color of fruit is better.

Micronutrients help plants to breathe properly. They take in the **carbon dioxide** we **exhale** and give us oxygen to breathe in. A tree or plant that has healthy leaves and stems will produce more and better fruit, vegetables, flowers and shade.

A lack of the micronutrient called **boron** causes beans (12, 13) to turn yellow and stop growing. This yellowing is called **chlorosis**. Chlorosis means absence of green. Heads and stems of cauliflower (14) turn dark brown. Celery (8) leaves turn brown and spotted.

Fruits such as apples (11) and apricots (9) do not bloom properly and blossoms do not stay on the trees. We call it (2) "blossom drop." If the fruit does appear, it may be small and **deformed** with cracks in the skins. Shoots or new growth on many plants will die back.

New corn leaves (3) stick together and will not open to the sun. New leaves cannot grow. Tomatoes (7) and peppers (6) get blossom rot and the blossoms fall off. Without blossoms there can be no tomatoes or peppers. Carrots (5) will develop hollow hearts and turn dark inside.

A lack of another micronutrient called **iron** causes young leaves (4) to turn yellow between the veins. Fruit such as strawberries do not have a shiny, bright skin and will become soft. If fruits and vegetables show extreme yellowing of their foliage, the crop will not bring top prices at the market. Spraying the leaves with the right amounts of micronutrients (17) seems to be the best treatment.

Another way to tell if a plant is lacking in micronutrients is to sample the soil in a lab. Your county extension agent can help you find someone to sample the soil. If the soil shows a deficiency, it will need to be **treated**.

In the early days of farming in Ohio, your great-grandfather used natural fertilizers from his (15) dairy or cattle **operations** to fertilize his fields. Any type of natural fertilizer, or manure, was very good for the soil because it provided **humus** as well as nutrients. Humus is that substance made up of dead leaves, stems, or organic matter. It may be rotted or digested by the animals. Humus keeps the soil loose and it is easy for the water to soak in. However, as the years went by, more nutrients were taken out of the soil by growing plants, and production went down.

When the nutrients **decreased**, production dropped. The **chemical** companies sold the farmers the needed fertilizers. Production again soared.

Another reason for the **decline** in **available** plant food was that farm sizes were **reduced** when the cities and highways took up so much of the good land. Farmers had to produce more crops on the remaining land. The supply of nutrients was eventually used up.

A decline in nutrients also came when the land was leveled so that it could be farmed and irrigated more easily. The leveled land was smooth, but the scraping and rearranging of the soil left many areas with a very thin layer of topsoil. Only heavy fertilization and added humus could bring the land into top production again.

Another problem arose when farmers were careless when they irrigated. The use of too much water **eroded** or washed away the topsoil. It flowed right along with the wasted water into drains and back into the rivers and finally into the ocean.

Another reason for the decline in nutrients is that many farms are worn out. This is true in some places in the eastern United States. The same crops have been planted in the same fields year after year and the nutrients have been used up.

A way to correct this problem and rebuild the soil is by crop **rotation** (16). Alfalfa, peas, beans and other types of legumes add nitrogen and nutrients to the soil without taking any out. By rotating or trading the growing of legumes with corn or grain, soil can continue to produce quality crops.

In your garden it is a good idea to rotate your vegetables. The soil does not wear out so fast, and diseases are kept to a minimum.

Can you see from this study that supplying nutrients for plants is as complicated as supplying nutrients to and for your family? In feeding the plants the farmer is feeding the world! The farmers in your area will have special needs in growing the crops that grow best there, but one thing is certain, every plant needs food!

Lesson: **Micronutrients**

Resources:

The importance of micronutrients in soil as related to production.

Objectives:

1. Students will learn about nutrients in soils and plants.
2. They will learn about micronutrients in soils and their importance to plant growth.

Specific things to look for:

1. Foods come from soil.
2. Micronutrients and their effects on plants.
3. Building up and wearing away of the soil.

Motivation:

How much do students already know?

1. What is a nutrient?
2. Why do our bodies need nutrients?
3. What happens to plants when they don't grow properly?

Vocabulary:

1. Released — turned loose
2. Nutrient — much needed plant food
3. Nourishment — nutrients
4. Nitrogen — nutrient for plant growth
5. Micronutrients — smallest quantities
6. Calcium — essential mineral for bones and teeth
7. Sodium — makes cells in our bodies live and work
8. Boron — essential nutrient necessary for cell division
9. Fertilizer — manure and chemicals used to enrich the soil
10. Organic — of plant or living organisms
11. Deficient — lacking
12. Decline — lower, lessen
13. Deplete — use up
14. Erode — wear away
15. Desperate — in serious trouble
16. Humus — organic material
17. Pollinized — transfer pollen grains to flower
18. Chlorophyll — green color in plants
19. Rotation — taking turns or trading off

Ag Unit: **Food and Fiber Core**

Major: **Science**

Minor: **Health and Nutrition**

Related Lesson Plans

Nutrition

Plant Growth

Soils

Remarks/Notes

Vocabulary (cont'd)

20. Chlorosis — yellowing or losing greenness
21. Foliage — leaves
22. Agriculture — care of the land
23. Reduce — make smaller
24. Production — to bring forth; to bear
25. Operations — farms or ranches
26. Deformed — misshapen

Suggested Activities:

1. Each student will need a copy of the background page in order to complete the micronutrients picture activity on pages 4 and 5. The key is on page 6.
2. Additional questions for discussion, group work or testing are in the enrichment activity on page 9. Key is on page 10.

Name ____________________

Enrichment Activity

Additional questions for discussion, group work or testing. (See answer key on page 10.)

1. Why are nutrients necessary?
2. Where does everything we eat come from?
3. Do plants need nourishment too?
4. What releases nitrogen from the air?
5. What does calcium do for you?
6. Where is sodium found?
7. What does **micro** mean?
8. What happens if too much fertilizer is given to plants?
9. What happens if no fertilizer is given?
10. Why must sugar be released in foods?
11. Why must seeds be perfect?
12. Chlorophyll is (red, green, yellow).
13. Do fruits need good flavor?
14. Do plants breathe?
15. Plants breathe out ____________________
16. Plants breathe in ____________________
17. Humans breathe in ____________________
18. Humans breathe out ____________________
19. Why do plants and humans need each other?
20. What is chlorosis?
21. How does the lack of boron show in cauliflower?
22. How does cauliflower look if it gets enough boron?
23. What happens to celery if boron is deficient?
24. True or False: Boron deficient beans are blue.
25. True or False: Apple and apricot blossoms fall if boron is deficient.
26. What does **deformed** mean?
27. Why are hollow-hearted carrots unappetizing?
28. In extreme cases of iron deficiency, how do plants look?
29. What do you notice about micronutrient deficiency in all plants?
30. Can farmers or orchardists make money on poor, unsightly crops or fruit?
31. What is foliage?
32. With what would you mix the nutrients in order to spray the plants?
33. What part of the plant is it best to spray?
34. Name 2 ways a farmer can tell if his crops need nutrients.
35. What office in each county might help you analyze your soil and plants?
36. Why are organic fertilizers better than chemicals?
37. Where can farmers get organic fertilizers?
38. What is humus?
39. Why did your great-grandfather need less chemical fertilizers than farmers of today?
40. What happened when cities and highways took over farmland?
41. What is bad about leveling farm fields?
42. What happens when farmers use too much water?
43. Besides soil, what else does erosion take from the farm?
44. Can a farm be abused? Explain.
45. How can you tell if he is careless?
46. What great service do farmers do for the world?
47. What is crop rotation? Why is it necessary?
48. How can you tell if a plant belongs to the legume group?

Enrichment Activity Key

1. Nutrients are necessary for healthy, growing bodies.
2. Everything we eat comes from the soil.
3. Plants need nourishment too, because they refine the nutrients for our use.
4. Lightning releases nitrogen into the air.
5. Calcium makes strong bones and teeth.
6. Sodium (salt) is found in dry lake beds and sea water.
7. Micro means small.
8. When too much fertilizer is given to plants they will die.
9. When no fertilizer is given to plants, they will die.
10. When sugar is released into foods, they become sweet.
11. Seeds must be perfect in order to make new fruits and vegetables.
12. Chlorophyll is green.
13. Fruits need good flavor in order to be appetizing.
14. Plants breathe like we do.
15. Plants breathe out oxygen.
16. Plants breathe in carbon dioxide.
17. Humans breathe in oxygen.
18. Humans breathe out carbon dioxide.
19. Plants and humans need each other in order to live.
20. Chlorosis is when plants become yellow.
21. Cauliflower will turn dark.
22. A cauliflower will be white if it has enough boron.
23. Celery becomes brown and spotted when lacking boron.
24. False
25. True
26. Deformed means misshapen or out of shape.
27. Hollow hearted carrots turn dark in the core.
28. In iron deficient plants, the young leaves turn yellow between the veins.
29. Plants become yellow when deficient in micronutrients.
30. Farmers cannot make money on poor fruit.
31. Foliage is the leaves of plants.
32. Nutrients are mixed with water when sprayed.
33. The leaves are sprayed with micronutrients.
34. The plants are yellow and have an unhealthy color when they need nutrients.
35. The agricultural agent for the Cooperative Extension Service in each county will help analyze your soil and plants.
36. Organic fertilizers are better than chemical fertilizers because they provide humus as well as nutrients.
37. Farmers can get organic fertilizers from manure.
38. Humus is a substance made of dead leaves, stems, straw and organic matter.
39. The land wasn't depleted of nutrients yet.
40. When cities and highways took over farmland, the remaining land had to grow more crops causing nutrients to be depleted and land wore out.
41. Leveled farms scrape away the topsoil.
42. When farmers use too much water, erosion occurs.
43. Nutrients are depleted when too much water is used.
44. A farm can be abused by depletion, decline and decrease of nutrients in the soil.
45. If a farmer is careless, the crops may be yellow, soil is not rich in nutrients and fields are unkept and become full of weeds.
46. The farmers feed the world.
47. Crop rotation is changing or trading off of crops every year. It is necessary to add nutrients to the soil and control disease.
48. Flowers of the legume group look like sweet pea blossoms.

Name ______________________

Micronutrients — What Have You Learned?

Match:

1. transfer pollen grains to flowers
2. green plant color
3. care of the land
4. when soil is carried by water or wind
5. dead leaves, stems, plants
6. leaves
7. very small amount
8. yellowing
9. released by lightning

______ a. foliage
______ b. pollination
______ c. humus
______ d. erosion
______ e. nitrogen
______ f. agriculture
______ g. chlorosis
______ h. chlorophyll
______ i. trace

Word bank for questions 10-15

a. world
b. nitrogen, calcium, sodium
c. keep us healthy
d. micronutrients
e. soil
f. boron, iron

10. Micronutrients are ______________________

11. Nutrients are ______________________

12. Nutrients are important to us and plants to ______________________

13. Everything we eat comes from ______________________

14. Farmers feed the ______________________

15. Chlorosis in plants can be a lack of ______________________

Extra Credit

16. Name 2 ways soils can be kept healthy. ______________________

17. Choose 3 fruits or vegetables and tell how you know they need special nutrients. ______________________

____

____

Micronutrients Key — What Have You Learned?

Matching:

a. 6
b. 1
c. 5
d. 4
e. 9
f. 3
g. 8
h. 2
i. 7

10. boron, iron
11. nitrogen, calcium, sodium
12. keep us healthy
13. soil
14. world
15. lack of micronutrients

Extra Credit Answers

16. could be one of the following:
    crop rotation
    returning humus to soil
    stop erosion
    adding necessary chemicals to the soil
17. (Answers will vary)

Plant Growth

Background — Plant Growth

Plants alone produce food. All other organisms simply convert plant food into fuel for their own bodies. A plant takes energy from the sun, combines the nutrients and water from the soil and produces the carbohydrates and proteins that we think of as food and fiber.

When growing plants, it is important to keep that in mind. A plant needs sunlight, water, nutrients, adequate temperature and air. If deprived of any one of these it will not be able to sustain itself. Whenever possible, use common sense in growing plants.

Light — All plants need light. Different plants, however, have adapted to different amounts of light. That is why some plants make excellent houseplants. Some plants can get sunburned and some require full light. A good rule of thumb is to consider where a plant originated and its growth pattern to estimate the amount of sun it needs. For example: a tropical tree that would have its top above the jungle will need full sunlight. A plant that grows on the forest or jungle floor will need diffused or low-intensity sunlight. A plant that grows on a prairie, desert or open meadow will need bright, direct sunlight.

It is also a good rule of thumb to realize that any sudden changes in the amount of light a plant receives will have an impact on the plant.

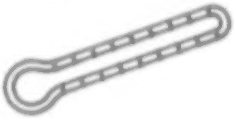
Artificial light is better than none. One problem is that the artificial light may not contain the full spectrum of wave lengths that a plant needs. If only artificial light is available, both incandescent and fluorescent light should be used. "Grow" lights can provide the full spectrum for plants.

Water — All plants need water. Here again the amount of water a plant needs depends upon the adaptations a plant has made. A desert plant, having adapted to its environment, needs little water.

Air — All plants need air, both above and below the ground. The one fact that people are not generally aware of is that a plant's roots need equal amounts of water and air. If the soil becomes waterlogged, the plant will literally drown. Again, the amount of air needed will depend upon the adjustments a plant has made to its environment. Cattails can thrive in standing water while a cactus would rot. Most mistakes with houseplants are made because people water incorrectly and alter the amount of air pockets in the soil.

Water consistently! Once or twice a week may be sufficient. If the soil feels wet to the touch, the soil is moist enough. If the plant wilts, you've waited too long and it will be damaged. Don't overwater, especially if you've let the plant dry out!

A plant produces more oxygen than it needs during photosynthesis. But when a plant is in the dark (at night), it respires as an animal would. (Photosynthesis is explained in the Life Cycle unit.)



Temperature — The temperature which a plant needs to thrive varies with the plant. Again, think of where the plant originated. A tropical plant will not be able to withstand a freeze. The exact temperature above 60°F is generally adequate for most houseplants. **Germination** of seeds usually requires at least a 70°F soil temperature.

Nutrients — Plants usually obtain nutrients through their roots from the soil (there are exceptions). The three major nutrients a plant needs are nitrogen, phosphorus and potassium, known by their chemical symbols N-P-K. When one purchases a "plant food" or fertilizer, a ratio will be found on the package. This ratio tells what percent of those nutrients is in that container. A 10-10-10 ratio means that 10 percent of the material in the package is nitrogen, 10 percent is phosphorus and 10 percent is potassium. There may also be some "micronutrients," a carrier, surfactant and other inert ingredients used to provide easy distribution of the nutrients.

The fertilizer ratio is always given by N-P-K so a 15-5-10 would be 15 percent N, 5 percent P and 10 percent K. As a beginner, try to find an even ratio — 10-10-10, 5-5-5 or 20-20-20 to fertilize with. Plants do have varying nutritional requirements as do people, but that is a more advanced lesson.

Schedule feedings on a monthly basis following the package requirements. Do not fertilize your plants in the late autumn or winter. The plant isn't getting much light so it will not be growing as actively. Begin monthly feedings in early spring (late March) as day length increases.

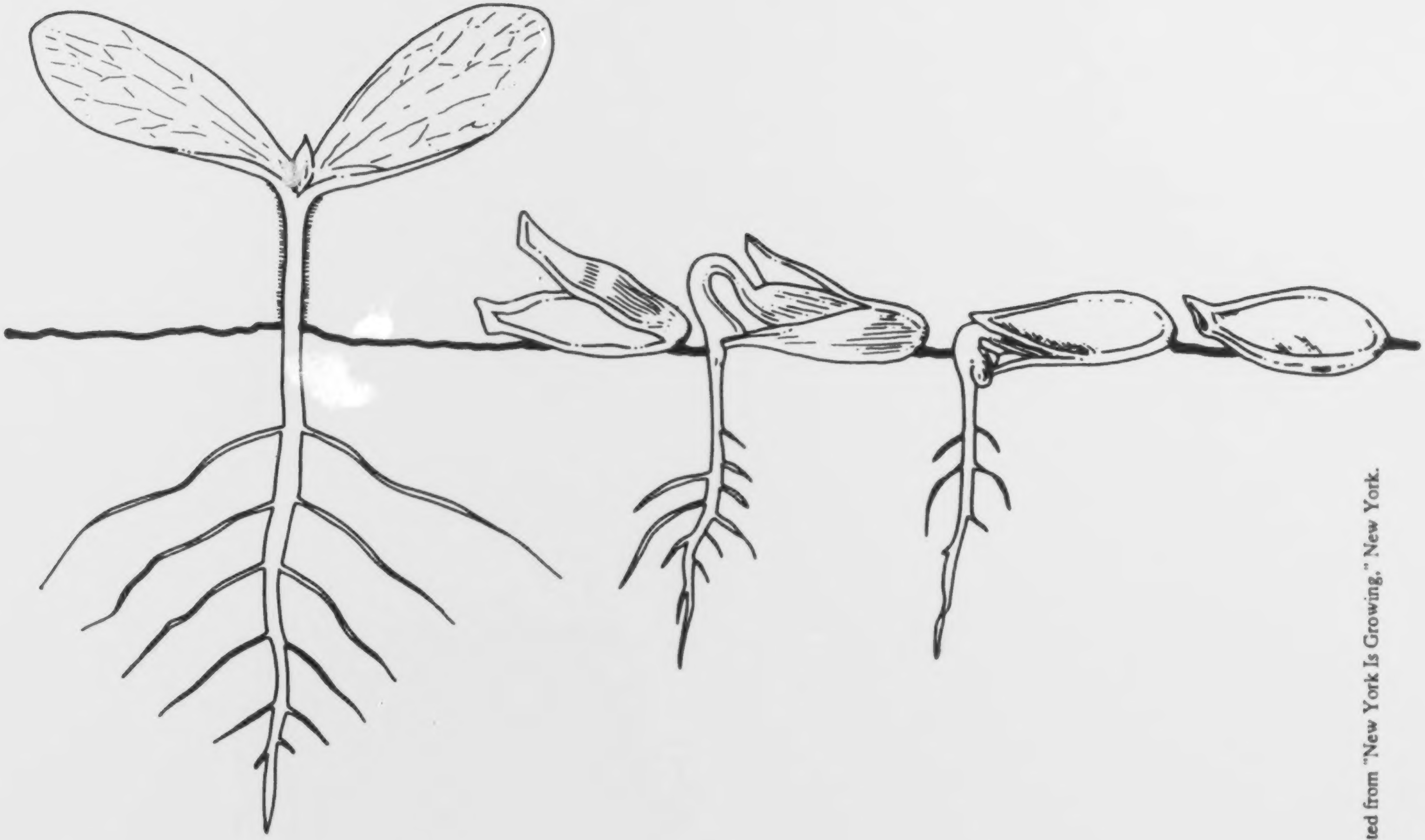
Selecting Plants — Common houseplants have been selected as houseplants because they can take some misuse, lower intensity light and humidity. If you are a beginner, start with common houseplants (such as Phylodendron, Spider plant, Geranium, Wandering Jew), not an exotic, difficult-to-grow fern. Build your confidence and commitment to being a horticulturist with a plant that can adapt.

Outdoors in a garden the same is true. Tomatoes, zucchini, zinnias, marigolds and beans are good starters. Work your way up to herbs and hybrid roses.

Common agricultural crop plants can be used as well. Wheat, barley, oats, peas, lentils, beans and corn are several examples.

Good luck! These tips should prove helpful. Just remember, plants are living things that require care!

Adapted with permission from "New York is Growing.



Adapted from "New York Is Growing," New York.

Lesson: **Plant Growth**

Resources:

Pie plate; "What grows up, what grows down?"
Beans, peas, alfalfa seed. "Grow beans, Grow" worksheet, construction paper, glue, scissors.

Premise:

Planting a crop or just a few seeds requires certain steps. Flow charts can be thought of as a blueprint or map that can be followed to reach a desired result.

Objectives:

1. Students will learn to make a flow chart.
2. Learn that all plants need sunlight, water, nutrients and a certain degree of temperature in order to grow properly.
3. Learn that not all plants grow the same way.

Specific things to look for:

1. What plants need for growth.
2. How plants reproduce: from seeds, cuttings, pits, other plants and runners.

Motivation:

1. Encourage a discussion of plant growth by asking students how a plant grows.
2. What starts a new plant?
3. What do plants need in order to grow? Chart the steps of planting.

Vocabulary:

1. Germination — the point when a seed, having adequate moisture, temperature and oxygen, begins to grow
2. Runners — a long trailing stem as in a strawberry that starts a new plant
3. Cutting — rooting or grafting a cut portion of a plant.

Trivia:

1. Clorophyll is the green coloring matter of plants. Chlorophyll has been used in medicines and as coloring for waxes and oils.
2. Aloe Vera is thought to have healing properties.
3. If a plant becomes waterlogged, it will literally drown and die.

Ag Unit: **Food and Fiber**
Core
Major: **Science**
Minor: Mathematics

Related Lesson Plans

Crop Production Steps
Soils
The Start of Life — Life Cycle

Remarks/Notes

Suggested Activities:

1. Make a flowchart on the steps of planting a bean or crop.
2. Identify the correct sequence to the "Grow Beans Grow" on page 7. Provide each student with a copy of "Grow Beans Grow" and ask the students to cut apart the nine sections. Let the students study the sections and place them in the proper sequence. Don't let the students glue them in place yet. Go over the sequence for the "Grow Beans Grow" activities. (Page 8 is the key.) Plant a few beans in pots to begin with and have the students compare the growth with those they started above.
3. Cut several carrots off about 1 inch from the top. Place in a shallow dish (about 1 inch) of water and watch them grow.
4. Use the worksheet "What Grows Down? What Grows Up?" (page 9). Explain that leaves grow toward the sun and roots grow away from the sun. Also, leaves grow away from gravity. Roots grow toward gravity.
5. Place half of a sweet potato in a glass of water. It will grow a vine 10 to 20 feet long.
6. Plant care (page 10).
7. Make a plant from a plant (pages 10 and 11).
8. Plant from cutting (page 11).
9. Sprout and grow one or more of the seeds (beans, peas, corn) by planting them in paper cups, egg cartons or small pots (page 12). Place soil in the container, plant the seed at least an inch deep and cover it with soil. Water the soil well but don't flood it. Place the container in a warm place 70ºF and keep it moist. Most seeds do not need light to sprout.
10. After the seeds sprout, point out to the students that the first leaves they see come from the seed. Allow the plant to grow until the first "real" leaves appear. These are the leaves that the new plant produced itself. Pull up the plants and examine the roots.
11. If a jar is used line it with a paper towel. Add water to wet the towel. Stuff the center with more wet towels. Slip two bean seeds and two corn seeds between the paper towel and the sides of the jar. Observe the seeds each day and keep a record of what you see.

Adapted from "New York Is Growing," New York.

Grow Beans Grow

(See directions on page 6, Suggested Activities, item 2)

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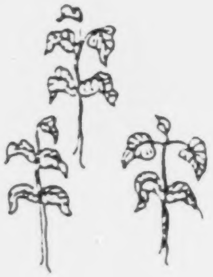

Harvest beans in the summer after the plant has matured.

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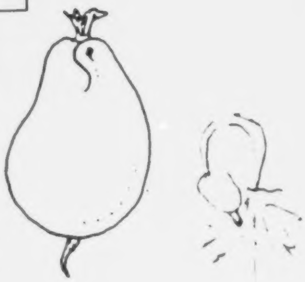

In several days some of the beans will germinate (will grow a root).

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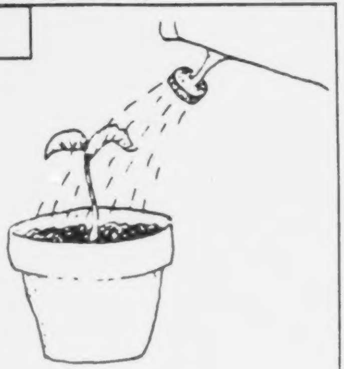

Water the pot when the soil dries out.

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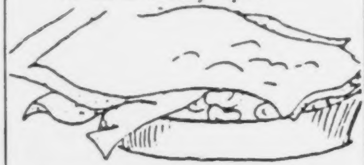
Place the dish in a warm place: near the furnace, heat register or in a sunny spot.



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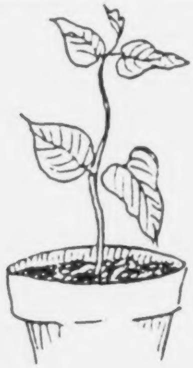
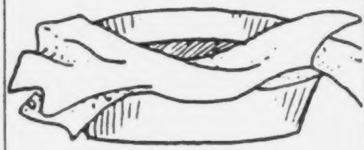


Plant it outdoors if it is spring.

☐

Place two wet paper towels on the bottom of a shallow dish. (A pie plate is good.)



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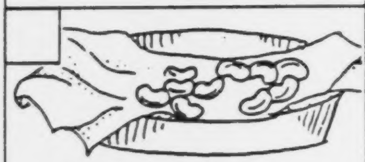
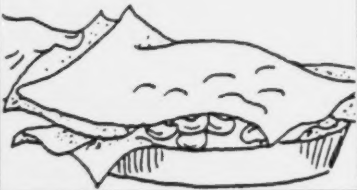


Put 10 navy beans on the towels and cover with two more wet paper towels.



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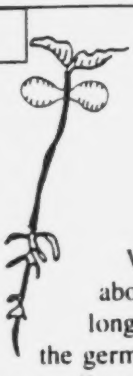
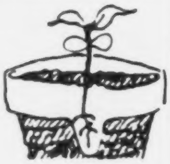
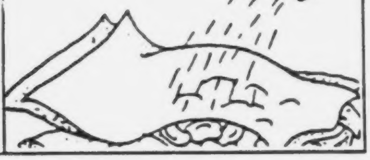




When the root is about one-half inch long, you may plant the germinated seed in a small pot with dark, rich soil. Put the seed about 1 inch under the surface of the soil.

☐

Sprinkle the towels with water every day. Keep towels moist. **Do not let the beans stand in a lot of water, as this will cause them to rot.**



Adapted from "New York Is Growing," New York.

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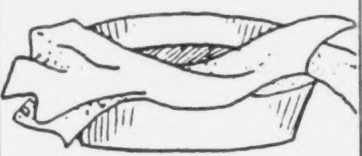
Grow Beans Grow — Key

1

Place two wet paper towels on the bottom of a shallow dish. (A pie plate is good.)



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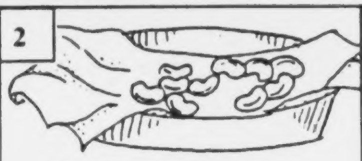
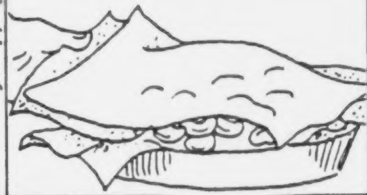
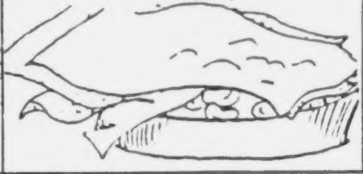


Put 10 navy beans on the towels and cover with two more wet paper towels.



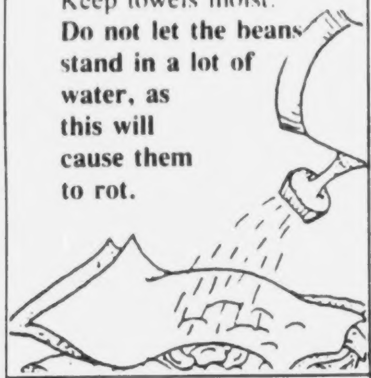
3

Place the dish in a warm place; near the furnace, heat register or in a sunny spot.



4

Sprinkle the towels with water every day. Keep towels moist. **Do not let the beans stand in a lot of water, as this will cause them to rot.**



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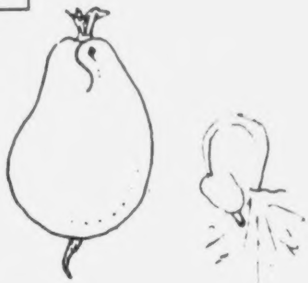
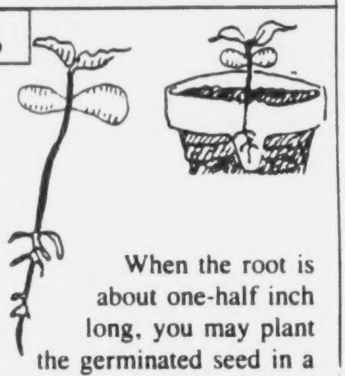


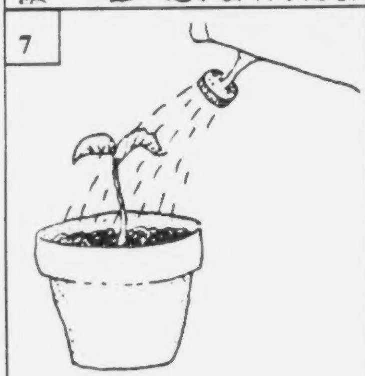
In several days some of the beans will germinate (will grow a root).

6



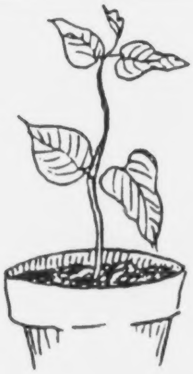
When the root is about one-half inch long, you may plant the germinated seed in a small pot with dark, rich soil. Put the seed about 1 inch under the surface of the soil.

7



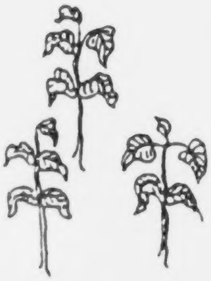
Water the pot when the soil dries out.

8



Plant it outdoors if it is spring.

9

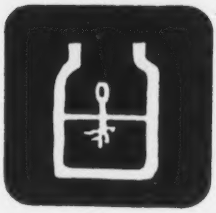


Harvest beans in the summer after the plant has matured.

Adapted from "New York Is Growing," New York.

What Grows Down? What Grows Up?

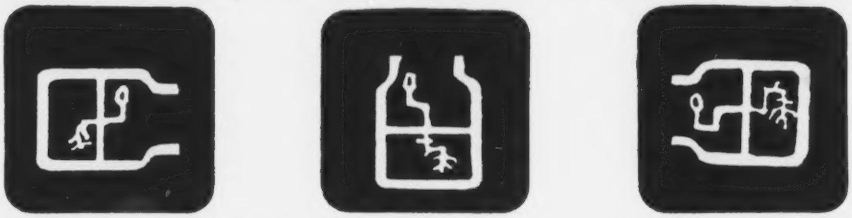
An Experiment To Learn How Plants Grow



Fill a jar with soil or sand and insert one or two bean or corn seeds halfway down into the jar next to the glass. Add a little water and close the jar with a water-tight lid. Begin with the jar upright. When the seeds send out roots, lay the jar on its side, and in a day or two, the roots will turn to grow down and the new top growths will grow up. Each time you turn the jar, the roots and stems will turn as well.

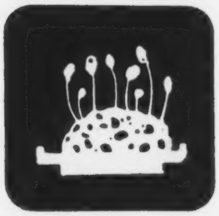
Why do you think the plant's stems and roots change the direction they grow in? What affect does light have on how plants grow? How are the crops a farmer grows like the seed or bean you planted?

The farmer grows his crops in a field of soil. Maybe you even have plants growing in pots of soil at your house. But did you know that some plants can grow without soil? In fact, scientists are experimenting all the time to find new ways to grow foods and fibers in water. Some people predict that this method, called "aquaculture," will be one of the main ways we grow food in the future.



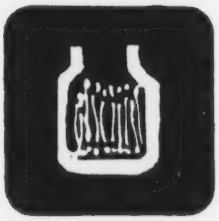
You can grow foods yourself without using soil. Here's how:

Salad on a Sponge



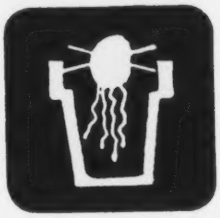
Soak a sponge in water, and set it in a dish of water on your windowsill. Sprinkle curly cress seeds (available at a garden store) all over the sponge. Keep water in the bottom of the dish. You can harvest your cress salad in about 10 days. (Note: You can also use a brick instead of a sponge if you wish.)

Sprouts in a Jar



Soak mung beans or alfalfa in cold water overnight. Drain the water and place in a clay pot with a small screen across the bottom drainage hole. Several times a day run water through the beans, soaking them completely. Each time, cover the top of the pot after draining it thoroughly, and place in a cool, dark place. In 3 to 5 days, you will have delicious sprouts. Wash and use them in salads, oriental dishes, casseroles, etc.

Pits in a Pot

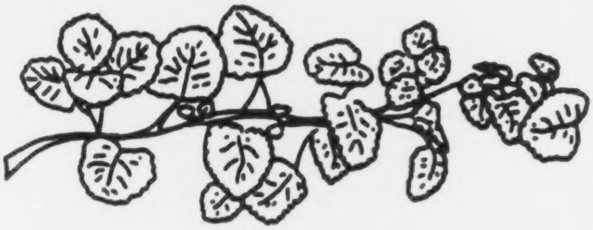


Wash an avocado pit and carefully remove its brown husk. You can use a whole sweet potato instead. Spear either the pit or the potato in the center with four toothpicks and set it on the edge of a glass or jar. Fill the jar with water to cover the lower part of the pit or potato. Refill with water to that level whenever needed. Set in a sunny area and watch for roots and stems to grow.

Reprinted with permission from "Farm in the School" Teachers' Resource Guide, Illinois Farm Bureau.

Plant Care

1. Keep the soil moist, but not soaked.
2. If possible, create a greenhouse-like environment by covering the plants with plastic. Make sure the leaves don't touch the plastic. This will keep the humidity high.
3. At this stage, indirect sunlight is best until the plants begin to grow. (The plant should be producing roots and not stressing itself by trying to produce food without water or nutrients.)
4. If you start the plants in water, transplant them as soon as roots are obvious.
5. Don't expect all cuttings to survive.
6. Fertilize the plants once they begin to grow.
7. Move plants to the sunlight or send them home with the students.
8. Discuss how many plants could be produced this way or by seed from one plant.



Make a Plant from a Plant

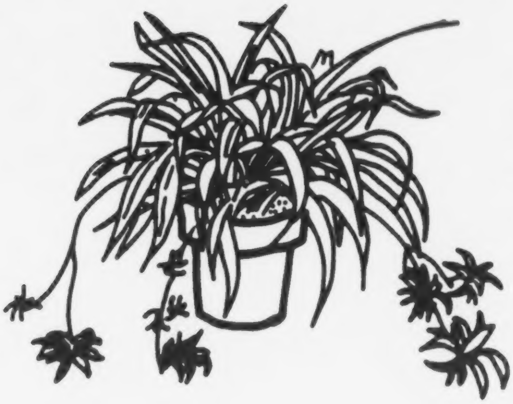
Background:

Some plants reproduce vegetatively as well as from seeds. Agriculture makes use of these plants mainly in the horticulture industry. Many common houseplants reproduce from cuttings or runners. An example is listed on page 11.

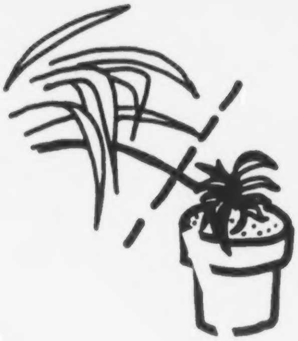
Materials:

- potting soil
- pots or containers of some sort (paper cups)
- water
- plants with runners: spider plant, strawberry begonia
- plants that reproduce from cuttings: Swedish ivy, Philodendron, golden pothos, Christmas cactus, wandering jew.

Adapted from "New York Is Growing," New York.



(Spider plant)

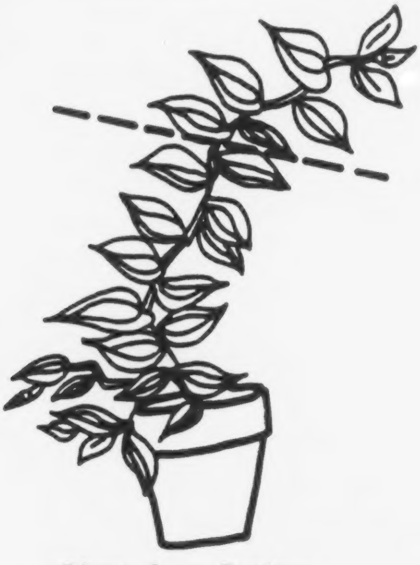


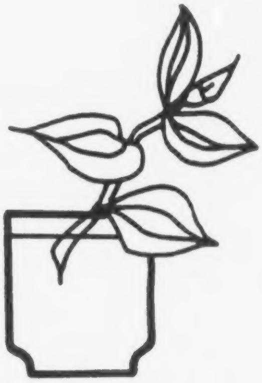
Activities:

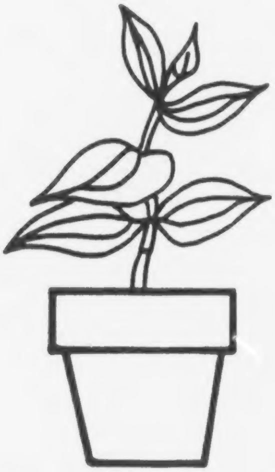
Plants from Runners

1. Remove the offspring plants from the runner.
2. "Plant" them into moist soil making sure that the "root" area has good soil contact.
3. Water the new plant.
4. If possible, cover the plant and pot with plastic to simulate a greenhouse.
5. Place the new plant in a place where it will not receive direct sunlight.

*For better rooting success, leave the plantlet attached to the runner until new roots form.







Plants from Cuttings

1. Remove the top 3 to 4 inches of the stem keeping at least 3 to 4 leaves on the stem.
2. Remove the lowest leaf (the area where the leaf attaches to the stem is called a "node." (This is where the roots will grow.)
3. "Plant" the stem in soil past the node or place it in water past the node.

Adapted from "New York Is Growing," New York.

Plants from Seeds

Background:

Most of the foods and fibers produced today reproduce sexually. This means that the plant produces seeds and grows from seed. Agriculture uses the seed as foodstuff, for oils, as feed and to breed and grow new plants. Often plants are bred to produce more seed per plant, per acre and per dollar invested. Students will be interested to learn that the growing process is very complex and that the seed stores a great deal of food.

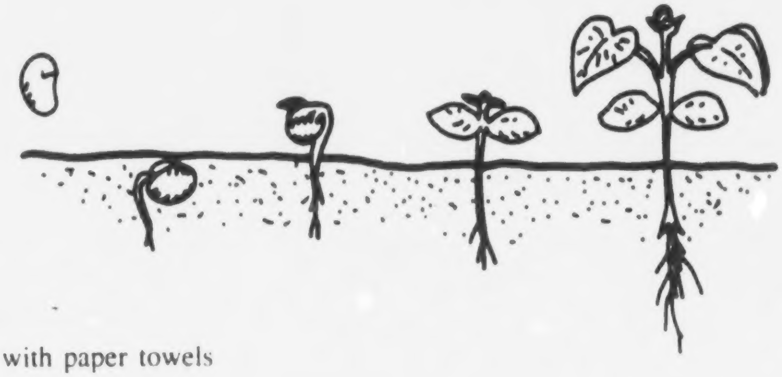
Materials:

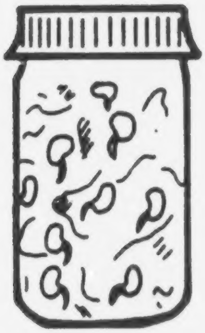
seeds — lima beans
peas
snap beans
corn
pumpkins
sunflowers
(large seeds would be best)

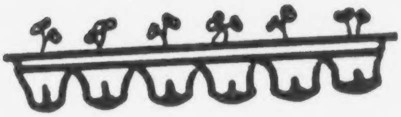
containers — pots
paper cups
egg cartons
mayonnaise jar with paper towels

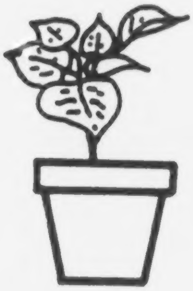
soil

water









Activities:

1. Sprout and grow one or more of the seeds listed above by planting them in paper cups, egg cartons or small pots. Place soil in the container, plant the seed at least an inch deep and cover it with soil. Water the soil well but don't flood it. Place the container in a warm place (70°F) and keep it moist. Most seeds do not need light to sprout.
2. After the seeds sprout, point out to the students that the first leaves they see come from the seed. Allow the plant to grow until the first "real" leaves appear. These are the leaves that the new plant produced itself. Pull up the plants and examine the roots.
3. If a jar is used, line it with a paper towel. Add water to wet the towel. Stuff the center with more wet towels. Slip two bean seeds and two corn seeds between the paper towel and the sides of the jar. Observe the seeds each day and keep a record of what you see.

Adapted from "New York Is Growing," New York.

Name ____________________

Plant Growth — What Have You Learned?

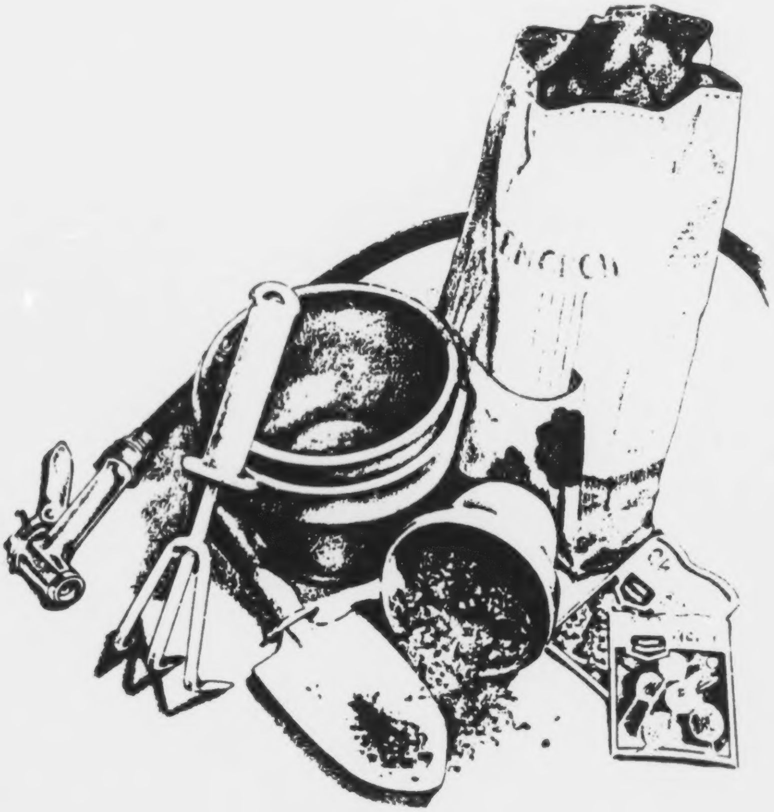
1. Explain the statement "Growing a Green Thumb."
2. Name three things all plants need:
3. Why does a pine tree need a different amount of water than a desert plant?
4. What does it mean when we say "a plant has drowned?"
5. What three major nutrients do plants need?
6. How does package labeling help the consumer when shopping?
7. Why have certain plants been selected as houseplants?

Define:

8. Transplant
9. Fertilize
10. Cuttings

Plant Growth Key — What Have You Learned?

1. Someone who knows little about growing plants.
2. Light, water, correct temperature, correct nutrients
3. The plants have adapted to their environment.
4. The roots become waterlogged and the plant will die.
5. Phosphorus, potassium and nitrogen
6. The labels tell the percentage of nutrients found in that product.
7. They take misuse, less light and humidity.
8. To plant in a pot as soon as roots appear.
9. Give the plant the necessary nutrients it needs in order to grow properly.
10. The top 3 to 4 inches of the stem.



Plants
Unit 16

Crop Production Steps

Background – Crop Production Steps

Farmers take many steps when deciding on what to plant and then the process of planting the crop. The most important decision is the crop to be planted. Farmers generally follow a rotation. A **rotation** helps control diseases and insects by not providing a host crop for more than one year. Rotations might be 3 or more years. An example of a crop rotation is corn – soybeans – wheat planted in succession.

The quality of the seed is the next consideration. There are many varieties and hybrids of seed which the farmer has to select from each growing season. No single variety is best suited for every field on a farm. Farmers try to select varieties which will produce the highest yields in each field. Planting certified seed ensures a high germination rate, low weed seed, and disease-free seed.

Soil tillage methods are the next decision. Many factors contribute to which method will be used. The weather and next crop to be planted are the two most important factors. When following alfalfa, corn (unless no-tillage), and many other crops, you must plow the field. Plowing turns the crop residue under to rot. The rotting **residue** provides organic matter which helps in water absorption and retention. The next step is disking. Disking helps break up clods and levels the soil surface a little. It is at this time that many preplant **herbicides** are applied, and the **disk** mixes the herbicides into the soil. The **harrow** follows the disk and finishes breaking up the clods and makes a fine seedbed. Many times the harrow is attached to the disk, eliminating a trip over the field.

After the seedbed is prepared, the planter is the next piece of equipment to enter the field. The planter places the seeds into the soil at the right depth and spacing to provide the maximum growth. Usually fertilizer is applied at the same time to provide nutrients to the crop as soon as the plants start to grow. The planter leaves enough space between the rows of seeds for a **cultivator** to work the soil later in the growing season. The cultivator stirs and mixes the soil between crop rows to remove weeds and aerate the soil. Row crops are generally cultivated two times a year. In Ohio, corn and soybeans are the most widely grown row crops. Wheat, oats, and part of the soybean crop are planted with a drill which does not leave enough space between the rows of the crop for cultivation.

Some farmers are using no tillage or conservation tillage practices to control erosion and decrease production costs in the area of tillage. In the absence of primary and secondary tillage, special effort is required when planting. A conservation or no till planter is specially equipped with cutters to provide a seedbed and fertilizer placement in the existing (last year's) crop residue. Drainage and soil temperature are equally important factors in getting a crop to grow in this manner.

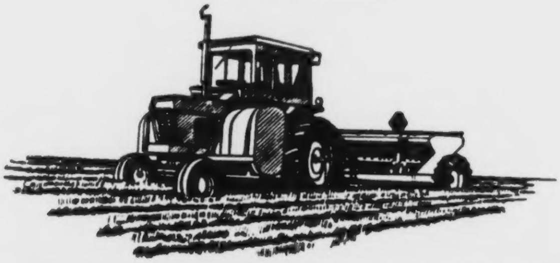
The rest of the season a farmer watches his/her fields for signs of diseases, insect damage and water needs. If necessary the farmer can call on **aerial applicators** to apply the proper pesticides to his/her fields. Most farmers in Ohio do not have irrigation systems for their entire farms, so water needs must be furnished from the rainfall.

At harvest time, the farmer uses a combine to harvest these crops. The front part of the combine (the header) is changed for different grain crops so that the grain can be gathered into the machine. The combine needs minor changes and adjustments when it is used for different crops.

Sumary of Crop Production Steps

1. Primary tillage (plowing)
2. Secondary tillage (disking)
3. Fertilizing
4. Planting
5. Applying pesticides
6. Harvesting
7. Drying and storing
8. Marketing
9. Record keeping and decision making

No Till Drilling



Lesson: **Crop Production Crops**

Ag Unit: **Food and Fiber Core**
Major: **Science**
Minor: **Language Arts**

Related Lesson Plans

Small Grains
Soybeans and Other Legumes
Soils
Soil Conservation
Corn

Remarks/Notes

Resources:

Farm magazines, local farmers and machinery dealers, local high school agricultural education departments, and the cooperative extension service in your county.

Premise:

Certain steps are involved in raising a crop. Each step is important in the production of food.

Objectives:

1. Be able to solve a problem on the sequence of crop production using conventional tillage methods.
2. Recognize 10 crop production terms.
3. Describe the steps needed to get crops from seed to the market.

Motivation:

1. How many of you have ever helped plant a garden?
2. What must you do to get the soil ready to plant?
3. What happens as a result of your hard work?
4. If you don't prepare it properly, what will happen?

Specific Things to Look for:

1. Farmers follow crop rotation practices.
2. The farmer must select seeds, plow the field, disk, harrow, plant and cultivate it.
3. When harvesting, the same machine can harvest all kinds of seed crops.

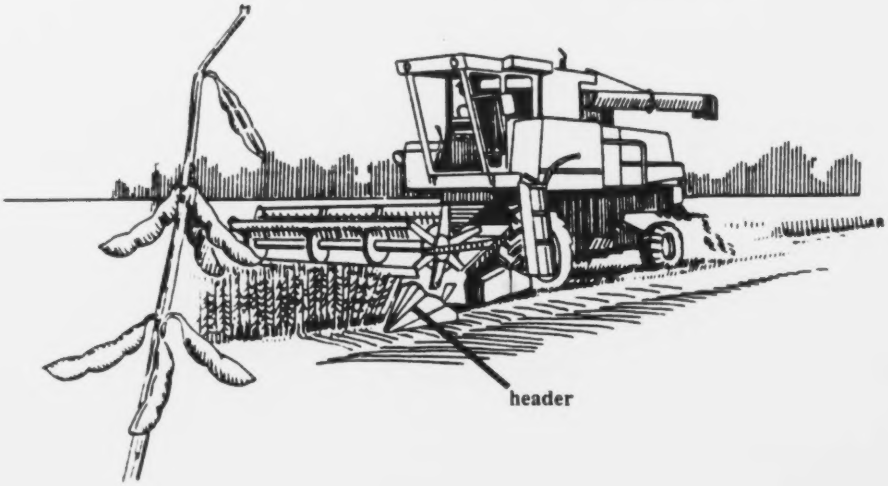
Vocabulary:

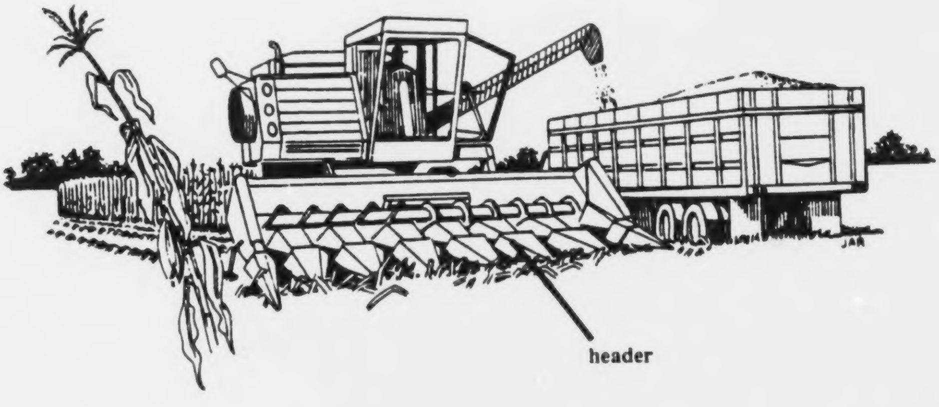
1. Rotation – one year plant one crop on a piece of land and the next year plant a different crop there
2. Residue – substance left over from last crop
3. Herbicides – chemical that kills selected plants
4. Disk – breaking up and leveling plowed ground with disk-shaped blades on a heavy frame
5. Harrow – breaking up and leveling plowed ground with a heavy frame with spikes or disks.
6. Cultivator – stirs and mixes the soil in order to control weeds or prepare land for irrigation
7. Aerial applications – apply pesticides as a spray using aircraft
8. Plow – turns the soil over, which puts the crop residue under the soil to rot
9. Insecticides – chemicals that kill selected insect pests
10. Harvesting – crop gathering, reaping

Suggested Activities:

1. Express to the students that everything has a beginning and an end. Ask where the beginning of a crop is. Write these down on the board.
2. Give the students the first step and ask what comes next. Guide the students through the steps to a finished product. Hand out "Ohio Grain Production" worksheet (page 5) and "Ohio Grain Production Steps" (page 6) and let students complete the exercises.
3. Now take the same pictures and compare each step to what they would do to plant a garden.
4. Have the students think about any game they play (baseball, soccer, etc.) and have them write out the steps in playing the game.
5. Have students plan and plant a school garden.
6. Collect pictures of farm machinery out of farm magazines. Tell which ones are used in the planting process.
7. Have students write a story telling about "Producing Crops." Be sure they include all of the steps in their stories.
8. Arrange a field trip to a machinery dealership or farm to see the actual equipment used to plant crops in Ohio.

Different combine headers are used when harvesting various types of crops.



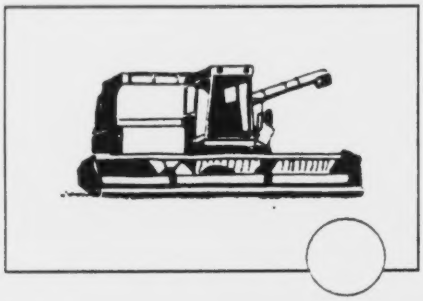


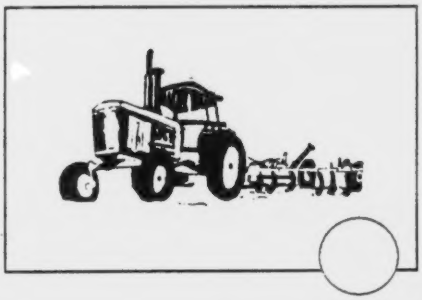
Name ______________________________

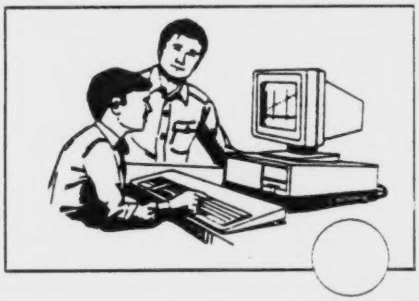
Worksheet: **Ohio Grain Production**

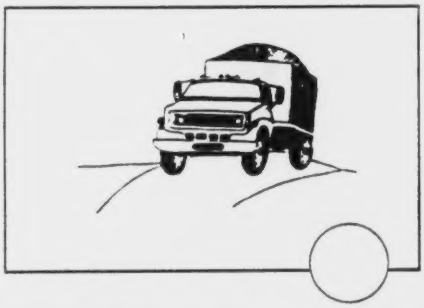
Crop farmers do many things to get food to you. Look at the pictures below. They show some of the things a crop farmer does. Find the picture that shows what a crop farmer does first. Write a "1" in the circle at the bottom of that picture. Now, write a "2" in the circle at the bottom of the picture that shows what the farmer does next. Put all the pictures in the right order by writing the numbers "3" through "9" in the rest of the circles. Use the numbered items below as a guide. Cut out the pictures and paste them on a new piece of paper in the right order. Finish the story by coloring the pictures.

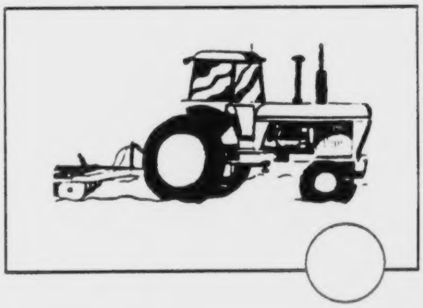
1. Primary tillage – plowing
2. Secondary tillage – disking
3. Fertilizing
4. Planting
5. Applying pesticides
6. Harvesting
7. Drying and Storing
8. Marketing
9. Record keeping and decision making

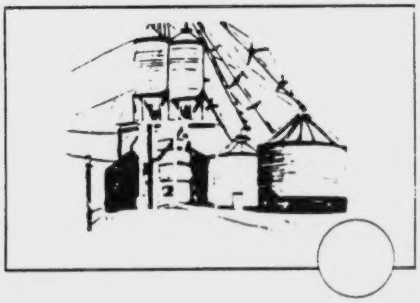


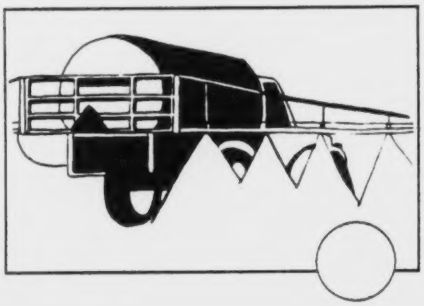


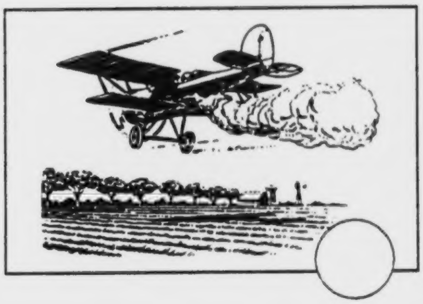


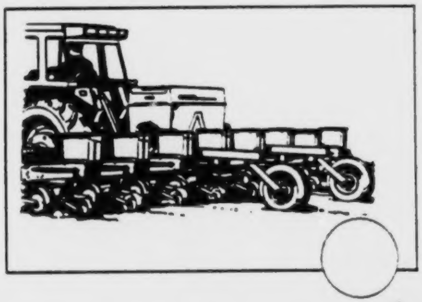












Ohio Grain Production Steps

Conventional Tillage

(See soil conservation methods for other methods of cropping.
They will basically combine the first three to five operations into one operation.)

1. **Primary Tillage** (first) = Loosens the soil and covers trash
   Plowing
   a. chisel
   b. moldboard
   c. heavy disk

2. **Secondary Tillage** = Prepares seedbed - levels soil
   Disking
   Field cultivating
   Harrowing
   Combination tools

3. **Fertilization** = Apply missing nutrients which are usually: Nitrogen (N) - Phosphorus (P) - Potassium (K) always given in this order. A fertilizer of 6-24-12 would have 6% N - 24% P - 12% K.

   The amount a farmer applies is the result of a soil test to determine amounts needed.

   Fertilizer may be a liquid (sprayed), a solid (broadcast or in row application), or a gas (nitrogen) knifed into soil.

4. **Planting** = Putting seed in contact with soil at right depth for crop and temperature for germination.
   a. Drill - Small Grains = wheat, oats, alfalfa, barley, rye, part of the soybean crop
   b. Planter - Rows crops for cultivation and weed control = corn, soybeans, popcorn, green beans, and sweet corn

5. **Pest control** = Spraying or cultivating for weed control (herbicides) or insect pests (insecticides)
   a. Pre-emerge – before plants come up
   b. Post emerge – after plants come up

6. **Harvesting** = Machines called combines consolidate the operations of gathering, feeding, threshing, separating, and cleaning grain.

7. **Drying and Storing** = Grains are usually harvested at too high a moisture content to keep for a long time (they will spoil). They need to be dried to a safe storage level with grain driers. They are then stored in containers called grain bins. These storage units will hold many thousands of bushels of grain.

8. **Marketing** = Prices for a given grain crop change daily in the marketplace. There are many ways a farmer can sell his/her crop. Ultimately, the grain is hauled to grain elevators (also called grain terminals) where it is sold.

9. **Record Keeping and Decision Making** = Although records are kept all during the crop production season, the total evaluation as to the success of the crop needs to be completed when crops are sold or at end of the year for tax purposes and planning for the next year.

Name ______________________________

Crop Production Steps – What Have You Learned?

Matching

_____ 1. rotation

_____ 2. residue

_____ 3. herbicides

_____ 4. harrow

_____ 5. disk

_____ 6. cultivator

_____ 7. fertilizer

_____ 8. aerial application

a. leftover substance from last crop

b. breaks clods of soil – first time over

c. breaks clods of soil – finer tillage

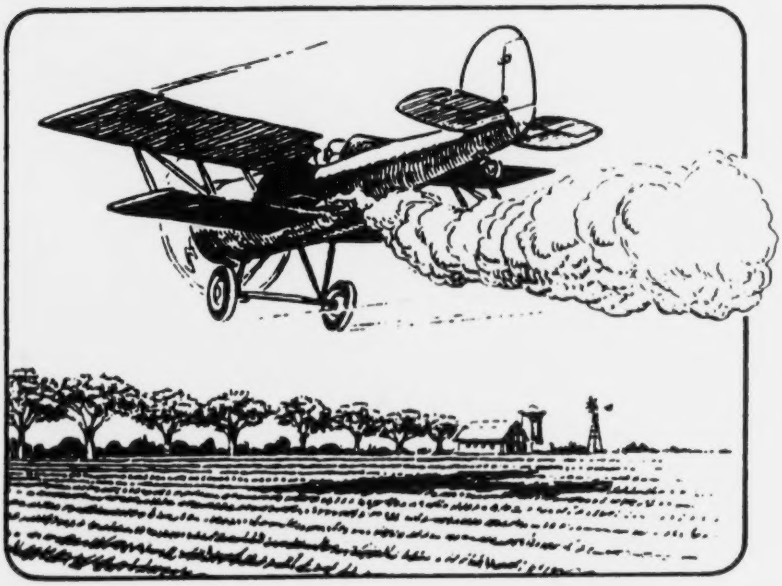
d. applies pesticides as a spray

e. trading off crop planting

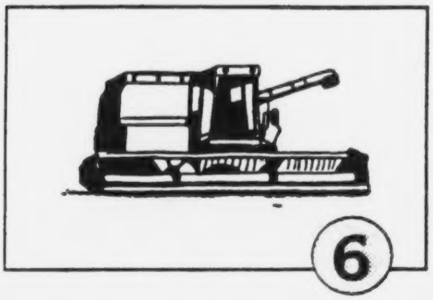
f. kills selected plants

g. stirs and mixes the soil

h. nutrients applied to soil to help plants grow



Worksheet Key: Ohio Grain Production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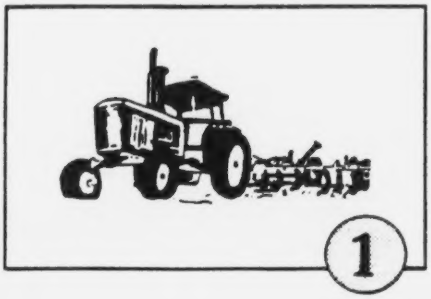
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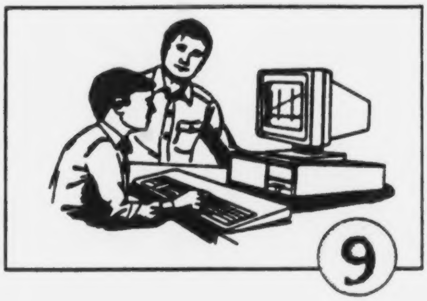
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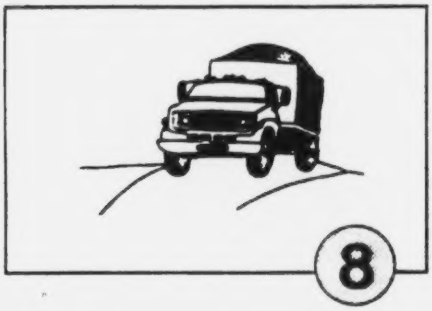
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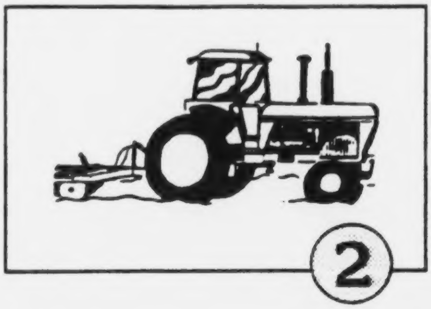
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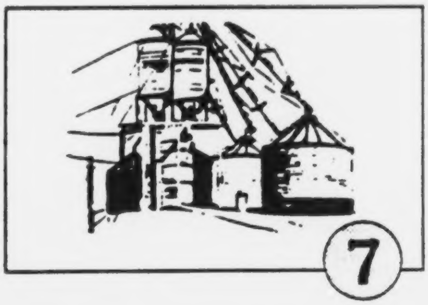
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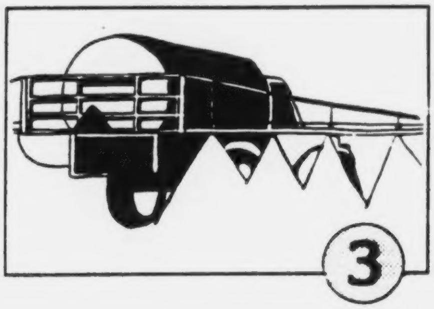
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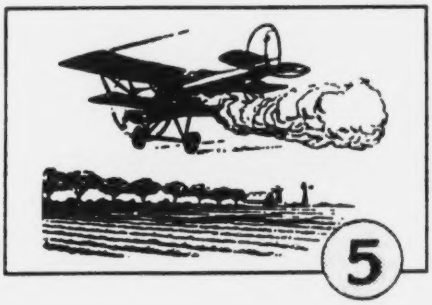
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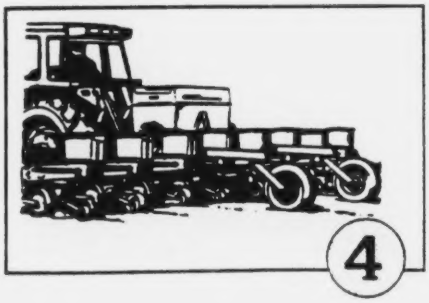
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Crop Production Steps Key: What Have You Learned?

1. e
2. a
3. f
4. c
5. b
6. g
7. h
8. d

Plants
Unit 17

Corn

Background – Corn

Where did it come from? For many years it was a mystery. Scientists knew that corn belonged to the grass family, but had never found any wild corn growing. Not long ago, they found some pieces of plants and tiny ears of corn in a cave in Mexico. These plants and ears of corn were more than 5,000 years old.

Scientists think the ancient plant these ears came from was a tall stalk with one ear at the top with the **tassel** growing out of the ear. The kernels were each wrapped in a pod and could fall off and plant themselves. Scientists also believe cave dwellers planted and cared for this pod corn. In time, the pollen of a grass called teosinte **fertilized** the corn. It took hundreds of years for the corn plants to grow stronger and the ears larger. People found the grain was good to eat. Tribes of Indians in the north began to grow corn.

All the Indian tribes of early Ohio raised corn. The Delawares used corn to make cornbread which they baked in clean ashes. The Shawnees grew several varieties of corn. Flint corn was used for hominy. A small cobbed corn was used for bread flour. A large, hard-grained type made delicious succotash and roasting ears. All of these **varieties** were white corn.

The Miami Indians were excellent farmers. The women planted and harvested the corn. Guests were served a special treat consisting of young ears of corn roasted on coals. "Sagamite," their most common food, was made by roasting the corn and making it into a mush to eat or to which fruit was added.

The Ottawa Indians' favorite corn dish was "Sagamity." The corn was ground into a fine meal, like rice. It was put into a kettle to boil, then cooked white fish was added. Corn was also the main dish of the Wyandots and Minge-Senecas.

Many foods we enjoy today were first tried by Indians. Indians showed the pioneers how to roast corn, make hominy, **succotash**, grits, corn pudding, and how to pop popcorn. Most important, though, the Indians gave the pioneers seeds and taught them how to plant and care for the corn. These Indian tribes would probably not be surprised to know that Ohio is one of the leading states for corn production today!

Corn produces seeds and grows from seeds. Agriculture uses the seeds as food stuff for people and animals, for sweeteners, corn starch, oils, fuel, and to grow new plants.

Corn is processed into a variety of **diverse** products. Close to half the corn crop is used each year as a main ingredient in livestock and poultry feeds. Hogs are the single largest "consumers" of corn. Beef cattle, chickens, and turkeys also are fed corn-based feed **rations**. Ultimately, we consume the corn as we eat the meat products from these animals.

Corn has many industrial uses, too. Corn starch is used as a binding agent in making almost all the paper produced in this country. Other diverse products such as crayons, surgical dressings, rubber tires, fireworks, and shoe polish all contain a corn by-product.

One of the newest uses for corn is an energy fuel for running vehicles. **Ethanol** has the potential to use millions of bushels of corn each year, as consumers realize it boosts octane ratings and reduces carbon monoxide emissions from vehicles.

Edible products made from corn add up to over 2,400 items in the grocery stores. The main ingredients used in foods, which come from corn include starch, corn syrup, sweeteners, corn oil, corn meal, and flour. Many soft drink manufacturers now use corn sweeteners to replace at least part of the sugar in their products. Corn-derived sweeteners and syrups are also used in baked goods, canned goods, candies, ice cream and other dairy products.

Agriculture technology continues to develop new uses for corn and corn products all the time. Degradable plastics, absorbents, and specialty films for the packaging industry are just a few of these. The research will continue. Corn has come a long way since native American Indians taught pioneers how to plant this important crop.

Lesson: **Corn**

Ag Unit: **Food and Fiber Core**
Major: **Science**
Minor: **Language Arts**

Related Lesson Plans:

Plant Growth
Crop Production Steps

Remarks/ Notes

Resources:

Seed corn, rich soil, paper cups, water, worksheets, food labels. Additional materials available from:

The Ohio Corn Growers Association
1100 E. Center St.
Marion, OH 43302
Telephone: (614) 383-CORN

Premise:

Corn has traditionally been one of the most important crops raised in Ohio. New uses for corn products mean it will continue to be a major agricultural commodity.

Objectives:

The students will follow the stages of growth from a seed to a plant and learn of the many products made from corn.

Specific Things to Look for:

1. how seeds germinate
2. the parts of the corn plant

Motivation:

In the 1950's Ohio was the nation's leading farming state and produced more corn than any other state. Today, Ohio ranks 6th in field corn production and among the top 10 states for the production of popcorn. Corn is raised in almost every county in the state; highest production typically is recorded in Clinton, Fayette, Madison, and Fulton counties.

Vocabulary:

1. tassel – the top of the corn plant that produces pollen.
2. fertilized – nutrients added to a field to nourish plants
3. varieties – breeds, species of a particular plant
4. succotash – usually corn and beans mixed together
5. diverse – different
6. rations – food given out in portions
7. ethanol – a renewable fuel for automobiles and other vehicles. It is made from corn and blended with gasoline to make gasohol.
8. edible – safe to eat
9. maize – the Indians' name for corn

Trivia:

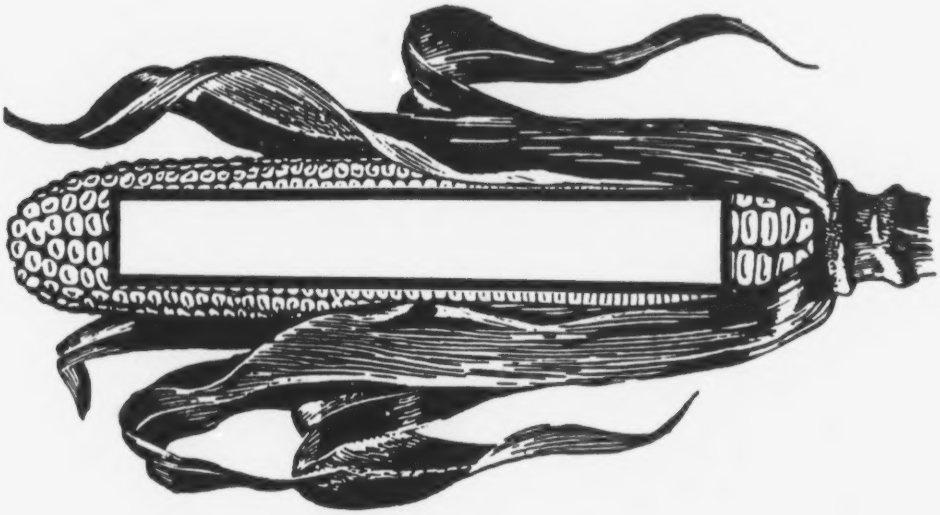
1. In 1844, Colgate and Company built a small corn starch factory in Columbus, Ohio. Today, corn starch dominates the world's industrial and food starch market.

Trivia *(continued)*:

2. The sweetener market consumes one-half billion bushels of corn annually. The three major corn sweeteners are glucose, dextrose, and high fructose corn syrup (HFCS). In America today, more sweeteners are made from corn than from sugar cane or beets.
3. The United States produces more than one-half of the corn grown in the world.
4. Some baby diapers and fuel filters have one thing in common – CORN. A new starch product has the ability to absorb as much as 2,000 times its weight of distilled water. Thus, its sponge-like ability makes it a component for disposable diapers as well as fuel filters.
5. In 1988, ethanol-blended fuels (10 percent ethanol, 90 percent gasoline) represented 8 percent of all U.S. gasoline sales, utilizing 340 million bushels of corn.

Suggested Activities

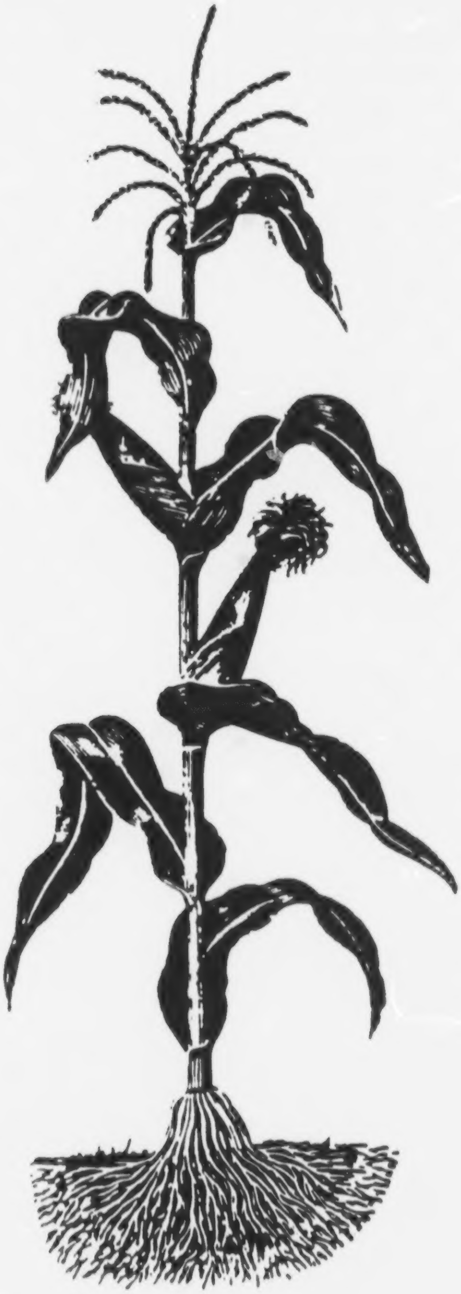
1. Place soil in paper cups and plant seeds an inch deep. Water soil well, but do not flood! Place containers in a warm, sunny place and keep the soil moist. After the plants emerge (4 to 6 days), point out that the first leaves come from the seeds. Allow the plant to grow until the "real" leaves appear. These are the leaves that the plant produced.
2. Have students match definitions and words to the diagrams of a corn plant on the worksheet on page 5.
3. Students answer questions and do math on the worksheet on page 6.
4. Have students find different recipes using corn or popcorn for the main ingredient and prepare in groups for class to enjoy.
5. Invite a corn producer to class to discuss the importance of this crop to Ohio agriculture.
6. Have students design a bumper sticker which promotes the use of a new corn product.



Name ______________________________

Worksheet: **Parts of a Corn Plant**

Label the picture, drawing arrows to show the parts described below.



Roots – The roots are the underground parts of a plant and are important because they provide a firm anchor for the plant and take up water and mineral elements from the soil.

Prop Roots – Because of the height of corn plants, these roots add stability or support to the plants.

Stem or Stalk – The stem is the above-ground portion or shoot, which gives the plant its internal structure. A stem has nodes and internodes which are not present in roots. A node is the point on the stem where a leaf is attached.

Leaves – The leaves are the principal food manufacturing organs of the plant. They absorb carbon dioxide out of the air and intercept sunlight. Their cells contain the green chlorophyll which captures the light energy needed to make food. The leaves supply the plant with water and mineral nutrients from the roots and carry away manufactured food to other parts of the plant.

Tassel – The tassel produces the pollen sacks which contain the pollen. The wind currents carry the pollen to the silks to fertilize the plant.

Silks – The silk is a soft hair on the ear. Upon fertilization of each strand of silk, a kernel of corn is formed.

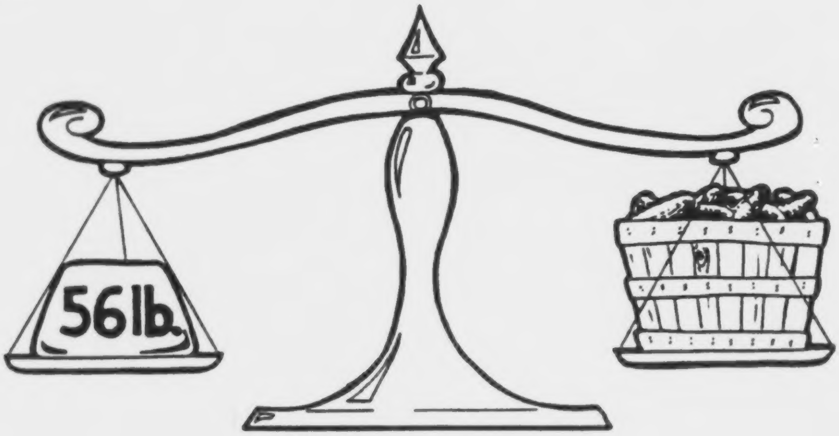
Ear – The ear of corn consists of rows of kernels.

Adapted from Nebraska's Ag in the Classroom Program.

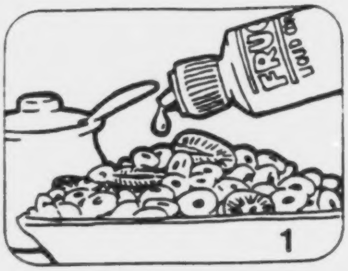
Name ______________________________

Worksheet: **What a Bushel of Corn Becomes**

Match the pictures to products made from a bushel of corn. Draw a line from each box to the words describing the picture in each box.



- 2 1/2 gallons of ethanol
- 33 pounds of fructose – a corn sweetener
- 2 pounds of corn oil margarine
- 14 1/2 pounds of corn gluten feed – 21 percent protein fed to livestock
- 17 pounds of carbon dioxide – which can be used to grow vegetables hydroponically
- 3 pounds of corn gluten meal – 60 percent protein fed to poultry



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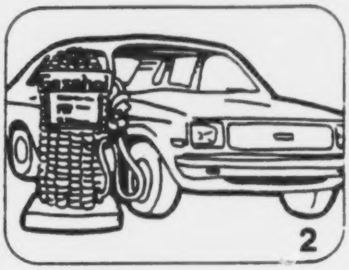

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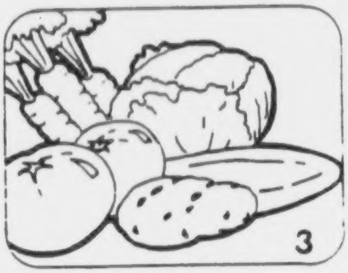

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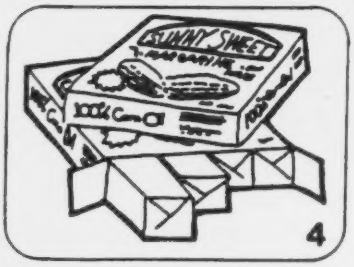

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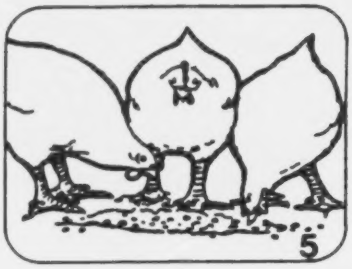

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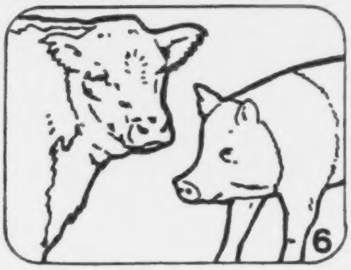


6

Corn – What Have You Learned?

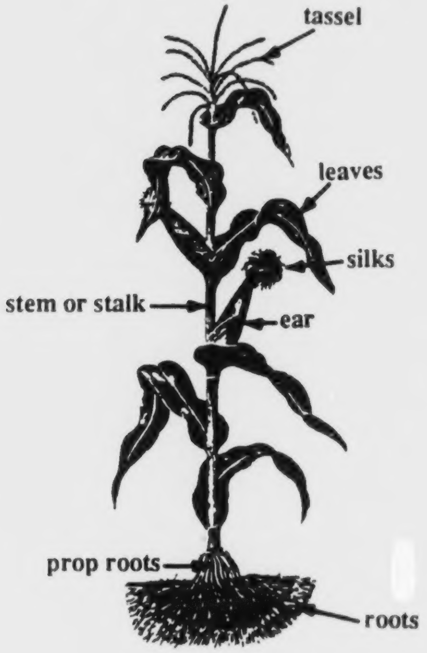
Word Bank

ethanol
tassel
corn syrup
research
livestock
hogs, cattle, turkeys, and chickens
Indians

1. Most soft drinks are manufactured using ______________________ for the sweetener.
2. ____________________________ showed the pioneers how to raise corn.
3. The part of the corn plant which pollinates the plant so that kernels of corn are produced on the ears, is the __________________________________.
4. A product of corn which burns cleaner than gasoline in automobiles is called ________________________________.
5. The major use of corn is for ___________________________ feed.
6. ____________________________ depend on a high protein feed made from corn for nutritious feed rations.
7. New products, like degradable plastics, packaging films, and super absorbents, need continued _________________________ and creative inventors to keep markets growing for corn.

7

Key – Parts of a Corn Plant



Key – What Have You Learned?

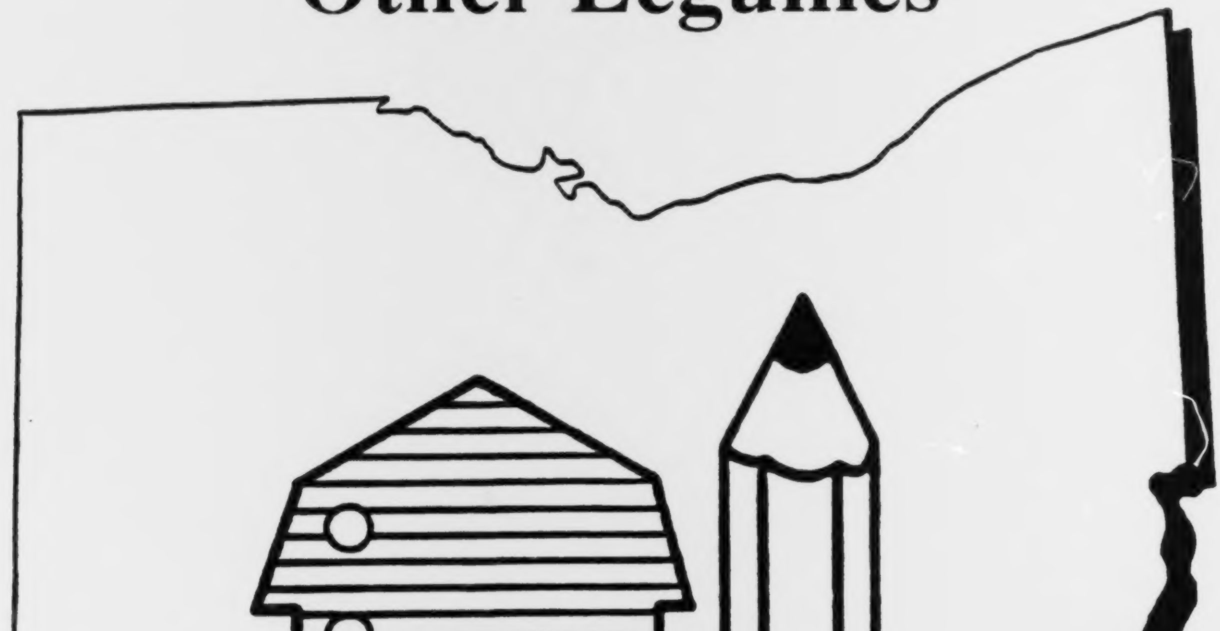
1. corn syrup
2. Indians
3. tassel
4. ethanol
5. livestock
6. hogs, cattle, turkeys, and chickens
7. research

Key – What a Bushel of Corn Becomes

1. 33 pounds of fructose – corn sweetener
2. 2 1/2 gallons of ethanol
3. 17 pounds of carbon dioxide – which can be used to grow vegetables hydroponically
4. 2 pounds of corn oil margarine
5. 3 pounds of corn gluten meal – 60 percent protein fed to poultry
6. 14.5 pounds of corn gluten feed – 21 percent protein fed to livestock

Plants
Unit 18

Soybeans and Other Legumes



Background – Soybeans and Other Legumes

Legumes include plants like soybeans, peas, beans (all kinds), alfalfa, and clover. Legumes have the ability to fix atmospheric **nitrogen** and use it to grow. They do this by providing a home for nitrogen-fixing bacteria on their roots in **nodules**. The nodules can be seen by gently digging up a legume and washing the dirt away. When squeezed they will show a reddish color. This means the bacteria are alive and fixing nitrogen.

Legumes have always been a major source of food for humans. Soybeans were cultivated in eastern Asia as early as 5,000 years ago. Snap and lima beans are native to the Americas where they grow wild in the tropical forests of South America. Lima beans received their name from the capital of Peru, Lima.

It wasn't until the 1900's that the American farmer produced soybeans, and then they were raised only to be dried and fed to animals as hay. Twenty-nine states now raise soybeans. In Ohio, soybeans typically bring in the largest share of income among all grains; ranking Ohio sixth in the nation in soybean production.

Ohio's alfalfa crop is a high quality **forage** crop. The high protein content of alfalfa makes it quite desirable as a beef and dairy cattle feed. When alfalfa (with other grasses) is cut, dried by the sun, and baled, it is known as hay. Hay is a major crop for Ohio farmers in almost every county. In fact, hay ranks as the fifth most important crop for Ohio. When alfalfa is cut and processed into pellets, it is fed to livestock as a high quality source of protein and other nutrients that animals need.

Nutrition

Legumes are a rich source of **protein**, vitamins, and minerals. George Washington Carver discovered the high protein content of the soybean. Soybeans can be ground into meal, which retains the high nutrient content. The meal is used in feed for all kinds of animals including chickens, hogs, fish, bees, and pets.

Soybeans are also processed for the high quality **oil** contained in this grain crop. When processed into an edible oil, it is used in hundreds of food products. Like all vegetable oils, soybean oil has no **cholesterol**. Often called soyoil, it is lower in saturated fats than most vegetable oils, and high in polyunsaturates, which cannot be made in the body. Soyoil is high in vitamin E and linolenic acid and helps the body absorb the fat-soluble vitamins A, D, E, and K.

Another important food ingredient, **lecithin**, is extracted from soybean oil. It has a wide range of uses, including keeping the chocolate and cocoa butter in a candy bar from separating.

Lesson: **Soybeans and Other Legumes**

Resources:

Beans, peas, soybeans, alfalfa seed

Premise:

Legumes have been an important crop to humans for centuries. From cattle feed to human consumption, legumes are important to all. Soybeans and alfalfa are important legume crops for Ohio farmers.

Objective:

Students will understand the importance of legumes to Ohio's agriculture. They will learn the nutritional benefits of legumes.

Specific Things to Look for:

1. Legumes include soybeans, peas, beans, alfalfa, clover, and others.
2. Legumes fix atmospheric nitrogen.
3. Nutritional value of legumes.
4. Ingredient statement provides information about contents.

Motivation:

Ask the students how many like to eat legumes. Now ask if they know what legumes are. From background information write on the board the different legume crops. Now ask if students have ever eaten a legume. Point out to students that legumes are high in calcium and phosphorus - elements that are improtrant to bone development.

Vocabulary:

1. Legumes – soybeans, peas, beans, alfalfa, clover, lentils
2. Nitrogen – nutrient
3. Nodules – a part of the root system
4. Forage – food used for grazing
5. Protein – nutrient made up of amino acids
6. Oil – from soybeans: is used in industrial and edible products
7. Cholesterol – part of our blood and found in fats from foods of animal origin
8. Soy – derived from soybeans
9. Lecithin – a natural food additive extracted from soyoil

Ag Unit: **Food and Fiber Core**
Major: **Science**
Minor: **Math**

Related Lesson Plans

Nutrition
Ohio's Largest Industry

Remarks/Notes

Trivia:

1. American farmers export more soybeans today than they produced in this country 15 years ago.
2. Many soybean varieties are as much as 40% protein. Soybeans are one of a few crops that can produce high quality protein directly from the soil.
3. Two cups dry beans equal five to six cups cooked beans. Why?
4. The ingredient which keeps peanut butter from separating is lecithin.

Suggested Activities:

1. **Edible Beans** (see page 5) – Each line lends itself to further investigation by students. Have the students pick a line or assign them a line to research. Use the library, grocery stores, seed catalogs, and health texts for sources of information. Also the Ohio Soybean Association can be contacted for soyoil and soybean information at P.O. Box 479, Columbus, Ohio 43216, phone: (614) 249-2422.

2. **Reading Ingredient Statements** (see page 6) – Ask students to bring in samples of food products in these five categories: 1) margarines, 2) salad dressings, 3) cooking oils, 4) sandwich spreads, and 5) solid shortenings. Sort labels by category. Review the rule for listing ingredients. Have students find ingredient statement and color code the first 3 ingredients on each label. (Color first ingredient yellow, second ingredient red, etc.)

3. **Soyoil** (see page 7) – Students work in groups to compile graphs of most common food ingredients found in food categories above. Help students create different types of graphs with their information.

4. Introduced in the summer of 1989, the green and gold Soymark identifies foods which are made with soyoil. Ask students to identify food companies displaying the Soymark on their products. (Check restaurants as well as grocery stores or their advertisements.)

5. Have a "chili" feed. Students bring ingredients and put in a crock pot. Cook all day. Serve and enjoy. (The popular 12-bean prepackaged mix could be used.)

6. **What an Emulsifier Does** (see page 8) – By definition, an emulsifier is a substance that has the ability to blend two liquids that normally would not mix, such as oil and water. Assemble the equipment for a group of students to demonstrate how lecithin acts in food products as an emulsifier.

7. Design legume seed collages. Collect a variety of seeds and glue into a design.

8. Invite a farmer to class to discuss raising soybeans in Ohio.

TM

SOYOIL

A registered trademark of ASA

Edible Beans

1. Dry beans since the earliest of times, have played an important role in human living besides keeping humans lively. Today, dry beans provide Americans with hearty good eating at a low cost.
2. Make a list of as many different beans as you can find. Note size, color and uses for each.
3. As dry beans are cooked they expand. Be sure the pot is large enough to allow the beans to expand 2 1/2 times!
4. Beans help to balance your diet. What is a balanced diet? What should a balanced diet consist of?
5. Protein is an important nutrient in ensuring health in humans. Dry beans have the highest protein content of all commercial seeds. The protein contained in beans we eat helps our bodies in many ways. What are some of these ways?
6. Dry beans are also a rich natural source of the B-complex vitamins. What vitamins are these?
7. Beans can be called the "energy food." What is meant by this statement?
8. Beans contain what essential minerals?
9. Beans supply bulk and natural fiber. Of what importance is this in maintaining a healthy body?
10. What might the phrase "a hill of beans" mean?

Adapted with permission from *Creative Ways to Cultivate Agriculture in the Classroom,* North Dakota.

Name ______________________________

WORKSHEET 1: **Reading Ingredient Statements**

Salad Dressing

GARDEN PASTA MAIN DISH SALAD

1 cup salad dressing
1/4 cup chopped parsley
1 tsp. dried basil leaves, crushed
1 garlic clove, minced
1 8-oz. pkg. mild cheddar cheese, cubed
2 cups broccoli flowerets, cooked
1 cup (4 oz.) tri-color corkscrew noodles, cooked and drained
2 medium tomatoes, cut in thin wedges
1/2 cup walnuts (optional)

Combine salad dressing, parsley, basil, and garlic; mix well. Add cheese, broccoli and noodles; mix lightly. Chill. Spoon salad on platter; surround with tomatoes. Sprinkle with walnuts. Yields 6 servings.

VARIATION: Substitute regular corkscrew noodles for tri-color corkscrew noodles.

PROOF OF PURCHASE

1986 32-OZ C

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NUTRITION INFORMATION PER SERVING

SERVING SIZE	1 tbsp.
SERVINGS PER PKG.	64
CALORIES	70
PROTEIN	0g
CARBOHYDRATE	2g
FAT (PROVIDES 90% OF CALORIES*)	7g*
POLYUNSATURATES	4g*
SATURATES	1g*
CHOLESTEROL (40 mg/100g)	5 mg*
SODIUM	85 mg

CONTAINS LESS THAN 2% OF THE U.S. RDA OF PROTEIN, VITAMIN A, VITAMIN C, THIAMINE, RIBOFLAVIN, NIACIN, CALCIUM, AND IRON.

*THIS INFORMATION ON FAT AND CHOLESTEROL CONTENT IS PROVIDED FOR INDIVIDUALS WHO, ON THE ADVICE OF A PHYSICIAN, ARE MODIFYING THEIR TOTAL DIETARY INTAKE OF FAT AND CHOLESTEROL.

INGREDIENTS: SOYBEAN OIL, WATER, VINEGAR, SUGAR, EGG YOLKS, STARCH, FOOD STARCH-MODIFIED, SALT, MUSTARD FLOUR, SPICE, PAPRIKA, NATURAL FLAVOR

LOW SODIUM

Rule for Listing Ingredients:
The closer an ingredient is to the top of the list, the more there is of that ingredient in the product. Ingredients are listed by weight in descending order.

Use colored markers or crayons to identify the 1st, 2nd, and 3rd food ingredients, by weight, in the sample label above. Mark the labels collected from real food products.

Name ______________________________

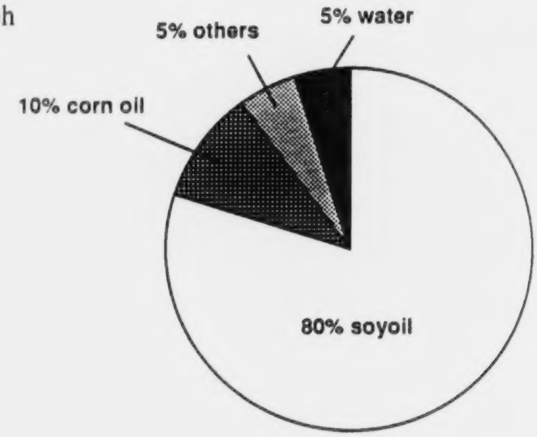
WORKSHEET 2: Soyoil

Soyoil is the leading consumed oil in the United States. In a national survey it was found in 83 percent of margarines, 90 percent of salad dressings, and 80 percent of cooking oils.

Select one of the five categories below and draw a graph representing the main ingredients (first by weight) from your samples of food labels.

Margarines
Salad dressings
Cooking oils
Sandwich spreads
Solid shortenings

Example graph



Name ______________________________

What an Emulsifier Does *

Equipment:

3 clear glass jars with lids
3/4 cup liquid cooking oil
1 T. liquid dishwashing soap (preferably colored)
1 1/2 cups cool water
measuring cup and spoons
masking tape for labeling jars

Procedure:

1. Label 3 jars as follows:
   - A. control group
   - B. without emulsifier
   - C. with emulsifier
2. Fill each jar with 1/2 cup water and 1/4 cup oil.
3. Set aside Jar A as a control to compare with the others. Note how the liquids separate.
4. Into Jar C add 1 T. liquid soap. Cover Jars B and C with lids. Shake each for the same amount of time (1 minute). Line up all the jars side by side to compare them.

Explanation:

---

*Adapted with permission from the *Minnesota Super Bean - Teacher's Guide*, 1985. Minnesota Soybean Growers Association.

Name ______________________________

Soybeans and Other Legumes – What Have You Learned?

Fill in the blanks.

Choose from this list.

Hay
First
Oil
Protein
Margarines
Emulsifier
Legumes
Meal
Vegetable
Soybeans
Ingredient

1. The family of plants including soybeans, alfalfa, and clover, which have the ability to fix atmospheric nitrogen are called ______________________.
2. Among all crops in Ohio, ______________________ usually rank first in income for farmers.
3. ______________________ is an important feed for beef and dairy cattle, and is often a mix of alfalfa or clover with other grasses.
4. Legumes are a rich source of ______________________, vitamins, and minerals.
5. Soybeans are most often processed for the ________________ or ________________.
6. Typically 80 percent of all cooking oils are made from soyoil; the label on the cooking oil bottle will probably say it is a 100% ______________________ oil.
7. The ______________________ statement on a food label lets you know what exactly is in the food item.
8. The food ingredient listed ________________ will be the most by weight in that food product.
9. Lecithin is often added to food products as an ______________________ to keep different ingredients from separating.
10. The majority of ______________________, salad dressings, cooking oils, and sandwich spreads are made from soyoil.

SOY OIL
margarin
SOY OIL
Soy Oil
pure soybean
IT'S DIGESTIBLE
SOY OIL
FINEST SHORTENING
SOY
IL
RESSING
SOY OIL
ayonnais

Edible Beans – Key

1. History of beans could be found in encyclopedias, social studies texts, or other library books.
2. List could include: lima, kidney, great northern, pinto, navy, white, soybean, garbanzo, lentils, dried peas, and others.
3. Students could look up recipes in many cookbooks.
4. 10 percent from protein, 60 percent from carbohydrates, no more than 30% from fats
5. Build and repair body tissue, muscles, glands, bones, teeth and skin
6. Thiamine, pyridoxine, niacin, and folic acid
7. They contain carbohydrates which, in beans, digest slowly and satisfy hunger longer.
8. Iron, calcium, potassium, and phosphorus
9. Bulk and natural fiber help maintain regularity and a healthy digestive system
10. Locate history of this phrase in library.

What an Emulsifier Does – Explanation

Shaking will mix the liquids - oil and water - making them break into smaller bits and temporarily blend. As they sit undisturbed, the jar with no emulsifier (Jar B) eventually will return to a state similar to the control Jar A. It is not a permanent or even a long temporary emulsion. Jar C, on the other hand, will have a layer of foam (suds) on top, but the liquid bottom is a blend of oil and water. This Jar C is a longer-lasting emulsion.

Lecithin acts the same way as the soap to keep ingredients blended. Lecithin is derived for industry as a by-product of the processing of soybeans into cooking oil. Most product labels indicate if lecithin has been added to the food. Other uses of lecithin, as a food additive, are as a wetting agent, release agent, or antioxidant.

Soybean Key – What Have You Learned?

1. Legumes
2. Soybeans
3. Hay
4. Protein
5. Oil, meal
6. Vegetable
7. Ingredient
8. First
9. Emulsifier
10. Margarines

Plants
Unit 19

Small Grains

Background – Small Grains

Small grains have been grown ever since humans began to cultivate the soil. The products from small grains have always been used as a staple in people's diets. Grains are collectively called cereals. Cereals provide a consistent source of feed for both livestock and humans.

Farming first began at least 7,000 years ago and developed in two areas: the alluvial plains of Mesopotamia and the Valley of the Nile.[1] Small grains were popular with early humans because they did not spoil as fast as vegetables. Cereals continued to be a very important part of the diet of people around the world, especially because they are a cheap source of calories.

The top three grain crops of the world are wheat, rice, and corn (called maize in many other countries).

Wheat

Wheat, as one of the world's most important crops, covers more of the earth's cultivated land surface than any other food crop. In most years, United States production from 3 out of 5 wheat acres is exported. Since wheat foods are an excellent, inexpensive source of nutrition, United States wheat exports help improve the nutrition of people throughout the world.

Many types of wheat are raised in the U.S. Even though the number of varieties available for planting are many (over 400 in the U.S.), the types of wheat classifications are few. The five major types of wheat are: hard red winter wheat, hard red spring wheat, soft red winter wheat, white, and durum. They are classed according to the color of the kernel, whether the grain is hard or soft, and the time of planting. Each has its favorite place to grow and its own best use in food making. Hard wheats (high protein) are best in bread flour. Softer wheats (high protein) are milled into flour for pastries, crackers, etc. Durum wheats are used for macaroni or pasta products. Ohio's climate and soils are best suited for raising soft red winter wheat.

A healthy wheat plant produces an average of 50 kernels and grows between 2 and 4 feet tall.

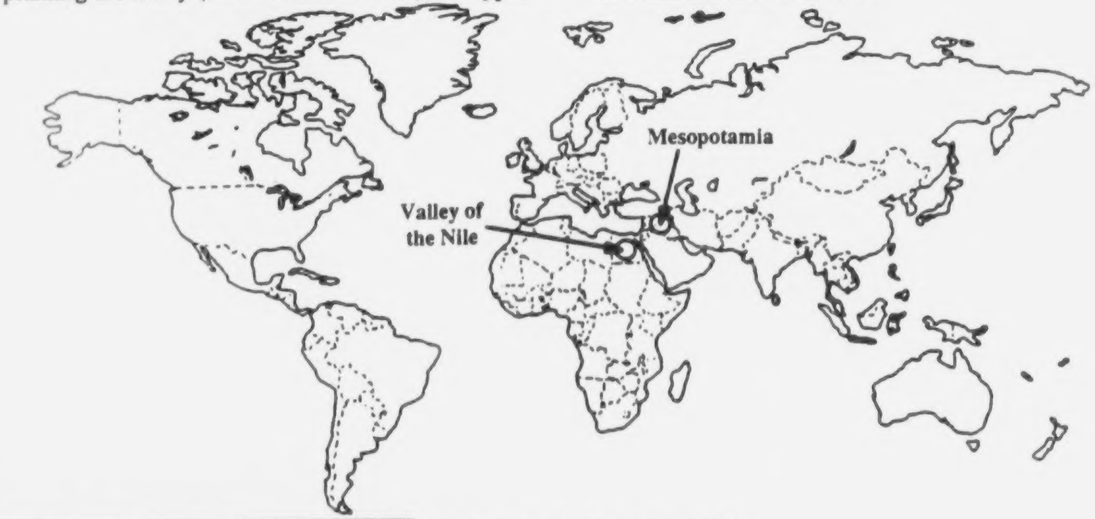
Other Small Grains

Other small grains raised in Ohio include oats, rye, and canola. Oats are raised mostly to feed livestock. Rye is raised for the unique flavor it gives bread products.

In recent years, Ohio farmers have planted fewer and fewer acres of oats and rye, in favor of more profitable crops.

Rapeseed is an alternative crop to wheat that some Ohio farmers are raising. Canola is a variety of rapeseed, which is known for its high oil content. As with other oilseed crops, two products result from processing: the oil and an animal feed product.

Other small grains may become profitable alternatives for farmers to produce in the future as new markets are established.



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[1] Lowdermilk, W.C. *Conquest of the Land*. USDA/SCS Bulletin No. 99, reprinted 1986.

Lesson: **Small Grains**

Resources:

Wheat kernels, cereals (like *Total*), flour, crackers, and oatmeal

Premise:

Small grains are an important part in everyday life for man. Ohio is also an exporter of small grains

Objectives:

Students will understand the importance of small grains to man and will identify different products made from small grains.

Specific things to look for:

1. History of small grains - especially wheat
2. Winter wheat, grown in Ohio, has different uses.

Motivation:

Discuss with the students what they already know about grains and grain products. How many of you have eaten something today with grain in it? Where do grains come from? What kinds of grains are there? Name several grain products.

Vocabulary:

1. Endosperm - inside of wheat kernel for flour, about 83% of the kernel's weight. Source of white flour.
2. Bran - outer layer of wheat, high in protein and fiber
3. Germ - sprouting section of the kernel
4. Staple - necessary food
5. Exporter - one who sends products out of the state or country.

Trivia:

1. A farmer produces enough wheat on 1 acre to provide bread for 10 years to a family of 4.
2. A bushel of wheat will make 70 1-pound loaves of bread.
3. The cost of the wheat in a loaf of bread is approximately 7 cents, which is the farmer's earnings.
4. Bread is the staff of life and a staple food the world over.
5. Today's combines can harvest the wheat needed for 70 loaves of bread in 9 seconds.
6. Each person in the U.S. consumes, on the average, 123 pounds of wheat and wheat products each year.

Ag Unit: **Food and Fiber Core**

Major: **Health/Nutrition**

Minor: **Social Studies**

Related Lesson Plans

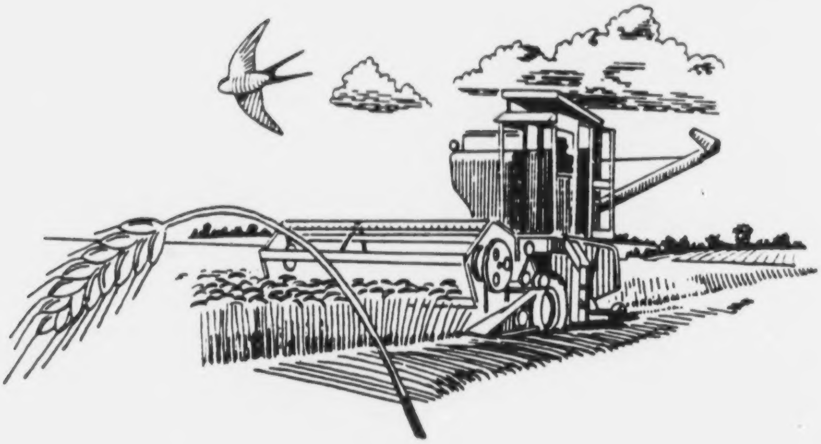
Crop Production Steps

Plant Growth

Remarks/Notes

Suggested Activities:

1. Gather the students around a table and pour out a small bunch of wheat. Let the students eat some and ask them their reactions. Ask the students what they are. Explain that wheat is a raw product. Show them the flour and ask what its uses are.
2. Show the students a bag of crackers and ask how many would like to have some wheat. Make sure to indicate that the cracker is a processed product. Tell the students the importance of wheat to humans as a food source.
3. Look at sample boxes of cereals. Have students list the ingredients and make a graph showing which grains are used most frequently.
4. Using the "Making Flour" worksheet (page 6), copy the steps on a chalkbaord. Divide students into groups and have them draw cartoon diagrams for each step. Arrange finished cartoons and explanations as a poster.
5. Let the students make some bread, following the recipe in a book. Contact your high school home economic's department for suggestions and assistance with bread-making programs.
6. Have the students list all the small grain products in their homes.
7. Have the students read "What's to Eat" H-m-m! Hot Rolls and Butter" (pages 7 and 8). After each month of the story, have the students tell a step in the production of wheat products.



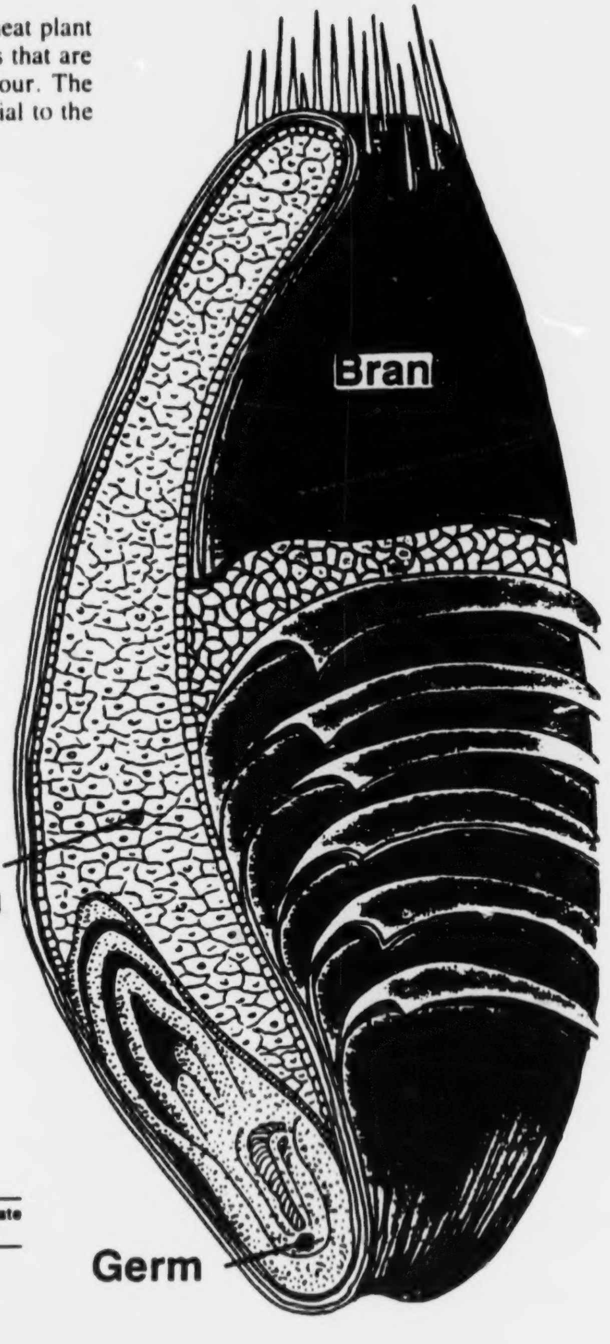
The Kernel of Wheat . . .

The wheat kernel is the seed from which the wheat plant grows. Each tiny seed contains three distinct parts that are separated during the milling process to produce flour. The kernel of wheat is a storehouse of nutrients essential to the human diet.

Endosperm ***(about 83 percent of the kernel weight)*** — It is the source of white flour. The endosperm contains the greatest share of carbohydrates and iron as well as many B-complex vitamins, such as riboflavin, niacin and thiamine.

Bran ***(about 14½ percent of the kernel weight)*** — Bran is included in whole wheat flour and is also available separately. Of the nutrients in whole wheat, the bran contains a small amount of protein, larger quantities of the B-complex vitamins listed above, trace minerals and indigestible cellulose material also called dietary fiber.

Germ ***(about 2½ percent of the kernel weight)*** — The germ is the embryo or sprouting section of the seed, usually separated because of the fat that limits the keeping quality of flour. Of the nutrients in whole wheat, the germ contains minimal quantities of protein but a greater share of B-complex vitamins and trace minerals. Wheat germ can be purchased separately and is included in whole wheat flour.



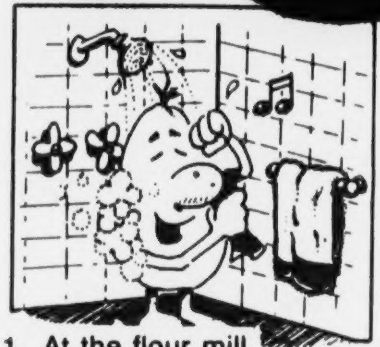
Nutrient Comparison of Selected Wheat Foods
(*100 Grams Edible Portion)

Product	Calories	Protein (grams)	Fat (grams)	Carbohydrate (grams)
White bread	267	8.28	3.92	48.82
Whole wheat bread	245	9.62	4.36	45.41
Cookies, chocolate chip	463	5.00	26.81	64.08
Doughnut	419	5.10	23.07	48.97
English muffin	237	7.91	1.94	45.94
Crackers, cheese	538	9.13	32.68	51.95
Pasta, dry	(368)	12.80	1.60	75.10

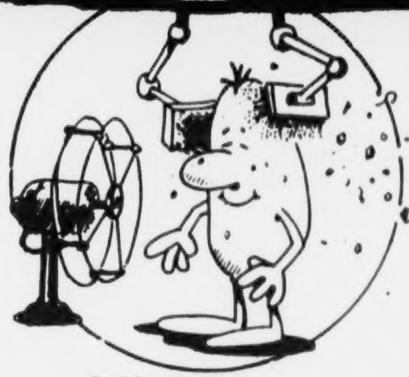
*100 grams equal 3.5 ounces
Parentheses ( ) denote calculated values
U.S.D.A. Human Nutrition Service

BEST COPY AVAILABLE

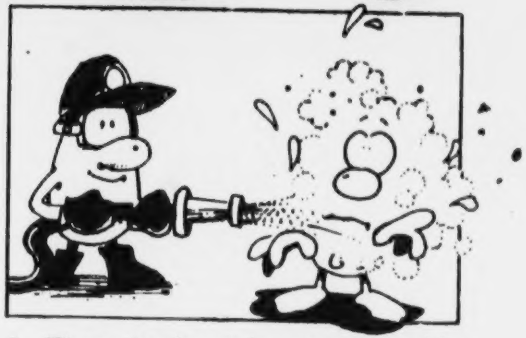
Making Flour



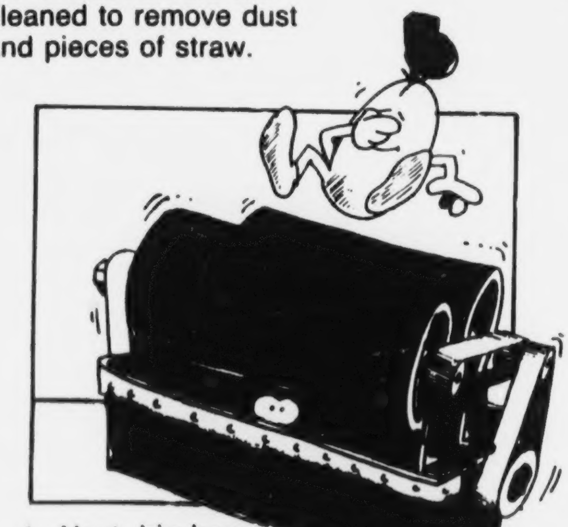
1. At the flour mill, the wheat kernels are cleaned to remove dust and pieces of straw.



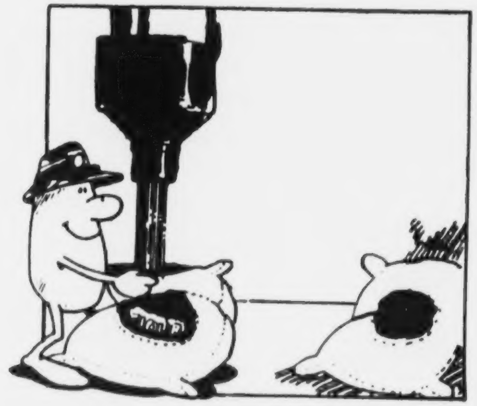
2. Mechanical cleaners also remove seeds of weeds and other plants.



3. Then the kernels are washed in a stream of water to take away stones and dirt.



4. Next, big heavy rollers break up the wheat and crush it.



5. It is then sifted many times to give us flour.

Reprinted with permission from [illegible] Washington Wheat Commission.

"What's To Eat?" H-m-m! Hot Rolls and Butter

The farm is where it all begins.

Bread, the world's most widely eaten food, starts with wheat. Here's how that wheat is grown and how it is turned into flour to make the bread you eat.

Growing the Wheat

The farm is where it all begins. So we'll start on a farm that produces the world's most widely eaten food — bread!

But, of course, you don't just go out and grow a loaf of bread. Bread is made from flour. And the flour comes from the kernels or seeds of wheat or other grains, such as rye and oats.

Do you live in Ohio? If so, you've probably seen golden wheat fields in early summer (typically around the Fourth of July).

But Ohio wheat farmers - or any farmers, for that matter - don't just fling some wheat seeds on the hills and hope for the best. There's a lot of thinking and planning and a lot of hard work that goes into growing a wheat crop.

Late September - October: It's planting time for winter wheat varieties. Wheat planting is called "drilling." That's because the seeds, which are really grains of wheat, are planted with a farm machine pulled by a tractor. This machine is called a drill. Often the ground is fertilized at the same time.

November: You can see early growth at this time. It looks like grass at this stage. The wheat must sprout before the snow covers it.

December - February: Winter wheat, as it is called, needs this time or it won't form a head of grain in the spring. Snow is important during these months. It serves as a blanket, protecting wheat from cold temperatures and winds. This allows the wheat to continue to grow slowly.

March: The wheat begins to grow again.

April: Chemical sprays are used to protect the wheat from weeds.

June: By late June the wheat grain reaches its "milk stage." That's when a milk-like fluid can be squeezed out of any green kernel that you break open with your fingers. Soon after this, the milk thickens and changes to "dough" in the kernel. The color turns from green to brown.

July: The wheat becomes dry and hardens. The farmer knows it's time to harvest. The ripe wheat plant is cut, separated from its seeds, and cleaned. A machine called a combine does all three jobs at once, right in the field.

The farmer took up to 10 months to bring this wheat field to harvest. Along the way, wheat farmers have to fight many enemies of wheat such as wheat diseases and weeds which threaten their wheat crop. Fortunately, there are ways to fight many of these enemies. But one thing farmers can't control is the weather. Extremely wet weather or very dry weather can also destroy the crop. Hail storms can ruin a wheat field.

Yet wheat farmers continue to struggle against these hazards. In successfully doing so, these wheat farmers have made the United States the largest exporter of wheat in the world, and the second largest producer of this food crop.

They have also provided the first and most important step in getting bread and pastry products to your table. Wheat farmers have grown the wheat that will be milled into flour that is used to make these food products.

What Foods Are Made from Wheat?

Think about the cereal you had at breakfast this morning. Was there wheat in it? Many cereals come from wheat.

Or how about that hamburger you had for lunch? It probably wouldn't have tasted nearly as good without the bun, which came from wheat. And tonight at dinner, as you wind spaghetti around your fork, once again you'll be eating a food that comes from another kind of wheat.

Every day wheat is a big part of the food you eat. Different kinds of wheat are used to make different kinds of products. But most of the wheat is turned into flour. And the flour is used to make everything from breads to noodles, from crackers to cookies.

Turning Wheat into Flour

After the wheat is harvested, the grain is loaded onto a truck. The truck carries the grain to a tall building, called a "grain elevator." Here, the grain is cleaned, dried, weighed, and separated into classes. Often, people who work at the country elevator also "grade" the wheat. Wheat is graded for its quality, based on government standards by the Federal Grain Inspection Service (FGIS). (And you thought only students got graded!)

Grading of wheat is important. It tells the farmer how much money he/she will get for hard work in producing the crop.

Turning that wheat into flour is called milling. Here's what happens.

After the wheat is graded, it may be sold to a miller. The miller grinds the grain into flour. Or the grain may be shipped to another grain elevator, a "terminal elevator." These elevators are much like the countryside elevators, but much larger. Here the grain is stored until it is shipped to a miller, or sent in ships that carry it to other countries.

Once the grain reaches the miller, the process of turning it into flour begins. To understand that process, you need to know what a wheat kernel is like. First, there is a covering around the kernel. That covering is called the bran. Most bran is used in making feed for livestock, but some is used to make delicious bran muffins.

Inside the bran is the endosperm. It's the endosperm that soon will become flour. Finally there is a tiny new plant in the wheat kernel, called the germ. Giant processing machines grind and sift the wheat kernels to make flour.

Millers place the flour into sacks and transport these sacks to bakers who produce over 250 million pounds of bread and many other food products each week in the United States. That's enough bread for a lot of sandwiches, slices of bread and butter, and hot rolls and butter, isn't it?

Name ____________________

Small Grains — What Have You Learned?

1. Farming first began in ________ and ________.

2. Grains do not spoil as fast as ________.

3. People eat more ____________ products than the raw grain.

4. In Ohio, farmers raise soft red ___________ wheat.

5. Soft wheats are used for __________ and __________.

6. Hard red wheat is used for __________.

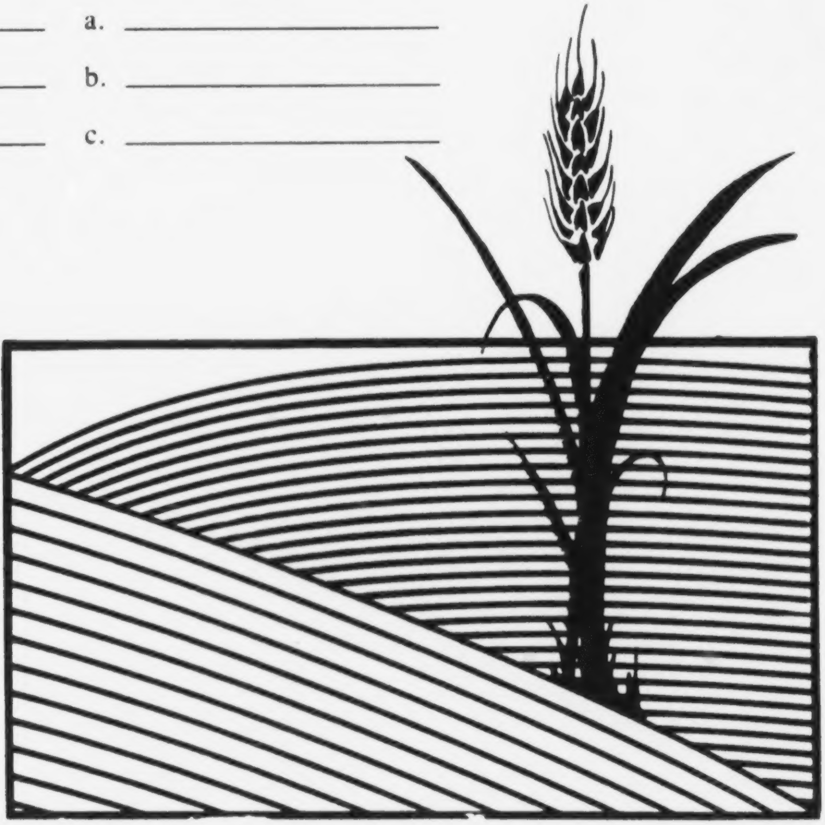
7. Durum wheat is used for __________.

8. List the parts of the wheat kernel and tell uses of each part.

Word Bank

Wheat
Winter
Mesopotamia
Valley of the Nile
Noodles
Vegetables
Crackers
Breads
Pastries

Parts	**Use**
a. ______________________	a. ______________________
b. ______________________	b. ______________________
c. ______________________	c. ______________________



Small Grains Key — What Have You Learned?

1. Lebanon and Iraq
2. Vegetables
3. Wheat
4. Winter
5. Crackers and pastries
6. Breads
7. Noodles

8.

Parts	Use
a. endosperm	a. white flour
b. germ	b. embryo (sprouting section)
c. bran	c. bran cereal, dietary fiber

Fruit Crops

Background – Fruit Crops

Fruit is the most **delectable** of all foods grown in Ohio. Some fruits are **bland**, and some fruits tease your tastebuds. Fruit can be fleshy and have **pits** or **stones**. Each fruit holds its own place because of color, taste, tang and just plain goodness! Fruits are refreshing, juicy, and crisp. They can be soft in your mouth or bright enough to polish your teeth.

Ohio's climate is well suited for raising many types of fruit. The growing season is long enough for large fruit (like apples, pears, and peaches) to mature. Ohio's fertile soils also provide the right environment for thousands of acres of small fruits (like grapes, strawberries, raspberries, and blackberries). The risk of freezing temperatures, which can wipe out an entire crop, is a fact of life for most Ohio fruit growers.

Some fruit crops take many years to bear their first fruit. Fruit trees need a lot of tender loving care, after they are planted, to mature into a commercially profitable tree. The trees have to be pruned, fertilized, watered, sprayed, and the weeds controlled around them. Pruning is cutting out the unwanted branches so the fruit will be big and juicy. Fertilizing ensures proper nutrients are available for the growth of the tree. Spraying makes sure that there are no insects or worms in your fruit.

Fruits like strawberries, grapes, and raspberries also need much tender loving care to yield in quantities large enough to be profitable for the producer. Because apples typically lead all fruit crops in Ohio in value of production, the following information is provided as an example of fruits raised in Ohio.

Apples

Although the Red Delicious is the most popular **variety** of apple grown, there are at least 7,500 varieties across the country. In Ohio, there are apple orchards in over half of our counties. Only 9 other states produce more apples than Ohio.

The Ohio apple industry has recognized the Melrose apple - a cross between a Red Delicious and a Jonathan - as Ohio's official apple. It was developed by a scientist, Dr. Freeman Howlett, at the Ohio Agricultural Research Center in Wooster.

An apple is nourished by its parent tree. About 50 or 60 leaves are needed to produce the food necessary for the growth of a single apple. When a tree bears a large number of apples, it cannot **adequately** nourish all of them, so some of the apples stop growing and fall off the tree. This is called the "June drop," since it usually takes place in the month of June. After the June drop, the apples remaining on the tree will receive enough nutrients to continue their growth if the weather conditions are good.

By the time apples have reached their full size, they no longer depend on the tree for nourishment. Instead they produce their own food by turning the starch stored in their flesh back into sugar. This is what makes the fully developed apple taste sweet. The presence of the sugar, plus the bright light of the sun, produce a chemical reaction which causes the apple to turn red, yellow, or to remain green.

Lesson: **Fruit Crops**

Resources:

Apple, knife, map of Ohio (Unit 4, page 9), worksheets

Additional information available from:

Ohio Apple Marketing Program
P.O. Box 479
Columbus, OH 43216
Ph: (614) 249-2424

International Apple Inst.
P.O. Box 1137
6707 Old Dominican Dr.
- Suite 210
McLean, VA 22101
Ph: (703) 442-8850

Premise:

Ohio fruit producers grow many kinds of fruits. Ohio has historically been well suited for growing fruit crops. By the late 1700's, John Chapman, known as Johnny Appleseed, had established apple orchards in the Ohio countryside. Grapes for wine-making, were first planted along the banks of the Ohio River, near Cincinnati.

Objective:

Understand the importance of fruit and fruit production in Ohio.

Motivation:

1. Decide what effect fruit has on your life.
2. Where does fruit place in food grouping?
3. Why are initial costs so great?
4. Would a new orchard begin to show profit in 2 years?

How much do the students already know?

1. What fruits are grown in Ohio?
2. The byproducts of fruit
3. Cost of spraying, pruning, fertilizing, harvesting, etc.

Vocabulary

1. delectable – delicious
2. bland – mild
3. pits – seeds, like cherry
4. stones – seeds, like peach
5. variety – strain, genus or breed of a plant
6. orchards – an area of land where fruit trees are planted and cultivated
7. adequately – sufficiently, being equal to need
8. atypical – not typical, abnormal

Ag Unit: **Food and Fiber**
Core
Major: **Mathematics**
Minor: **Social Studies**
Art

Related Lesson Plans

Crop Production Steps
Ohio's Largest Industry

Remarks/Notes

Trivia:

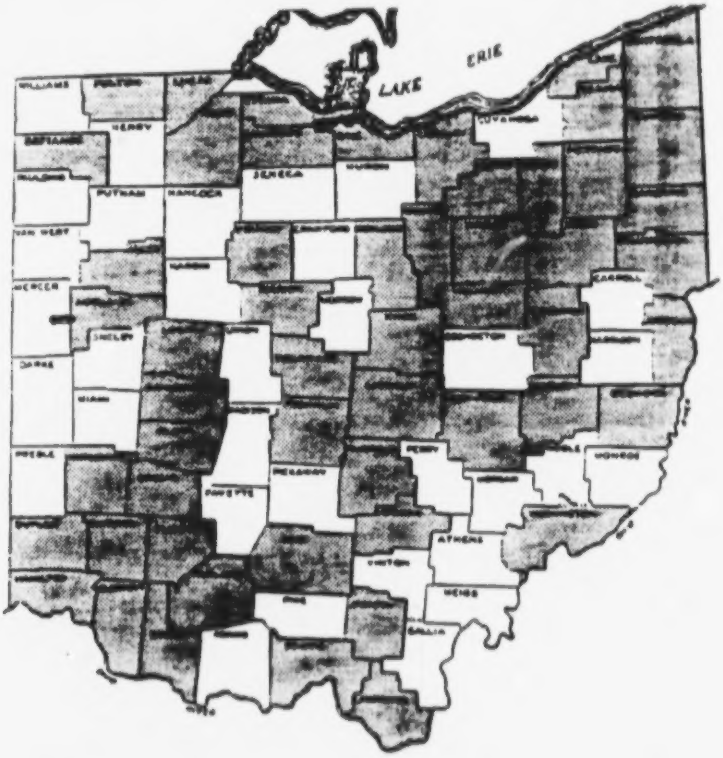
1. Apples do not grow in Florida and Hawaii because these states have too little winter. Apples do not grow in Alaska because it has too much winter. Apples grow in all the other 47 states.
2. An apple tree can live for an indefinite period of time, but its best production will come between the 7th and 20th year.
3. Ohio ranks 10th in the nation in apple production.
4. A mature apple tree produces enough apples for 225 apple pies, or between 10-15 bushels in a good growing year.

Suggested Activities:

1. Have the students list the many ways fruits are prepared to eat.
2. Have the students cut out and paste pictures of fruit on trees they draw.
3. Reproduce the map of Ohio (Unit 4, page 9). Give each student a copy. Ask them to color all the counties with commercial orchards as reported by the Ohio Apple Marketing program. These counties are the following:

Ohio Counties with Commercial Orchards

Allen
Ashland
Ashtabula
Auglaize
Belmont
Brown
Butler
Champaign
Clark
Clermont
Clinton
Columbiana
Coshocton
Defiance
Delaware
Erie
Fairfield
Franklin
Fulton
Geauga
Greene
Guernsey
Hamilton
Highland
Hocking
Holmes
Jackson
Jefferson
Knox
Lake
Lawrence
Licking
Logan
Lorain
Lucas
Mahoning
Marion
Medina
Montgomery
Muskingum
Ottawa
Portage
Richland
Ross
Sandusky
Scioto
Stark
Summit
Trumbull
Tuscarawas
Warren
Washington
Wayne
Wood
Wyandot



4. Have students read the story, "No Doors, No Windows, A Star Inside" (pages 5 and 6), and have them guess where the star is. Cut an apple horizontally to show the star. Discuss with the students why an apple is like a house. (It houses the seed, protects it, and provides a good seedbed after it rots.) Relate to the students that all fruits contain seeds.
5. On a graph show fruit values for the years given on the Fruit Crops – Understanding Graphs (page 8). Have students complete worksheet. Note fruits are stated in different units of weight.
6. Have students complete multiplication worksheet, page 7.

“No Doors, No Windows, A Star Inside”

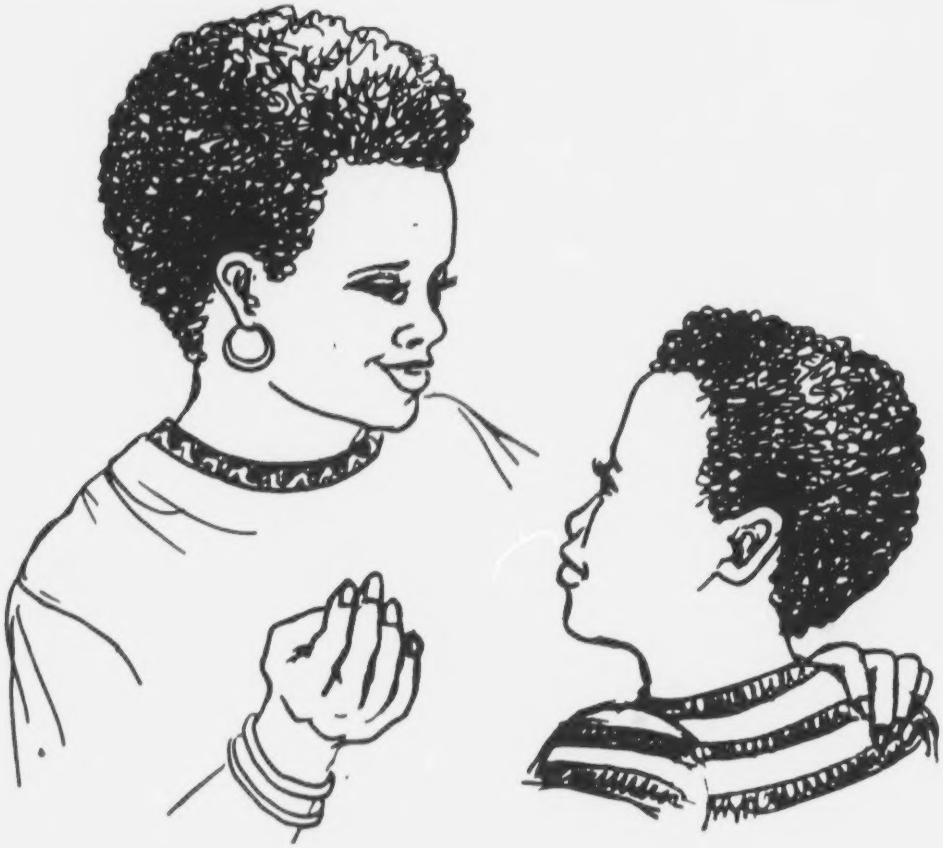
Once upon a time, in a far away town, just about the size of your town, there lived a little boy very much like one of you.

One day, when he had played all the games he could think of, and had watched all the television he cared to, he went to his mother, who was very wise, and knew all about what little boys like to do, and he said,

"Mother, what can I do?"

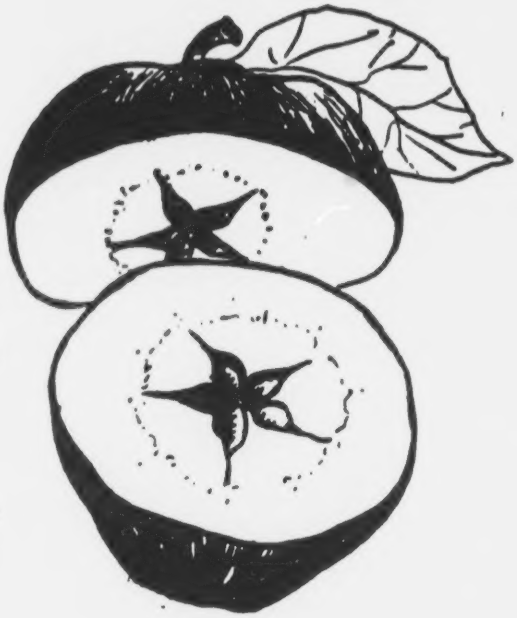
His mother thought for a minute or two, then said, "I know of a little red house with no doors, no windows and a star inside. Do you think you can go on an adventure to find it and still be back in time for supper?"

"Oh, yes!" exclaimed the little boy happily, and off he went.



First, he went to his grandmother's house at the top of the hill. He found her making gingerbread cookies in her big, warm kitchen. As he was finishing his second cookie, he asked her about the little red house with no doors, no windows and a star inside. She shook her head and said, "No, I don't believe I know of a house like that. Why don't you ask the wind? The wind goes everywhere. I'm sure he can help."

So the little boy went outside to ask the wind about the little red house with no doors, no windows and a star inside.



And the wind said, "Oooooo, ooooo-ooooooo!"

It sounded to the little boy as if he was saying "Come with me!" So the little boy ran after the wind.

He ran through the grass, over the hill and into the orchard. And there, on the ground, under an apple tree, was a little red house! A little red house with no doors, no windows.

But where was the star? He picked it up, and it filled up his hands. He ran home to mother.

"Look, Mother! I found the little red house with no doors, no windows. But where is the Star inside?"

Mother cut the apple in half. Now the little boy could see the star inside.

Can you see it?

Adapted with permission from "New York is Growing," New York "Ag In The Classroom."

Name ______________________________

Worksheet 1: **Fruit Production**

Directions: Complete the multiplication problems and show your work.

1. A dwarf apple tree grows to about 7 feet tall. It produces 2 bushels of apples per year. If 600 trees are planted on 1 acre of land, how many bushels of apples will be produced on that acre?

_____________________ bushels

2. A bushel of apples weighs 44 pounds. How many pounds of apples can one dwarf apple tree produce?

_____________________ pounds of apples

3. A standard apple tree grows to be about 25 feet tall. Somewhere between 27 and 36 trees are normally planted on one acre. This type of orchard will produce 900 bushels of apples (A bushel of apples weighs 44 pounds.) How many pounds is this?

_____________________ pounds

Adapted from "New York Is Growing," New York.

Name ________________________________

Worksheet 2: **Fruit Crops - Understanding Graphs**

Top Four Fruits in Value of Production for Ohio

FRUIT	1966	1976	1986
Strawberries			
Pounds	5,000,000	8,000,000	5,700,000
Value	$ 1,075,000	$ 3,040,000	$ 3,477,000
Apples			
Pounds	90,000,000	105,000,000	90,000,000
Value	$ 4,835,000	$ 15,120,000	$ 15,660,000
Peaches			
Pounds	5,000,000	15,000,000	2,500,000
Value	$ 519,000 *	$ 2,809,000	$ 725,000 *
Grapes			
Tons	17,000	14,700	8,000 *
Value	$ 2, 108,000	$ 2,690,000	$ 1,762,000

*Atypical growing year for this crop. (Source: Ohio Agricultural Statistics Service)

Directions: Circle or provide correct answer as indicated.

1. Strawberry production (**increased / decreased**) by (**3 million / 700,000**) pounds from 1966 to 1986.

2. Peach production (**increased / decreased**) by (**10 million / 12 1/2 million**) pounds from 1966 to 1976.

3. Apple production (**increased / decreased / stayed the same**) from 1966 to 1986. During those same years, value of production (**more than tripled / stayed about the same**).

4. Rank 1, 2, 3, and 4 the four fruits produced in 1986. Rank as 1 the fruit that produced the most pounds; rank as 4 the fruit that produced the least pounds. To change tons to pounds, multiply the number of tons by 2,000.
   Apples ( ) Peaches ( ) Strawberries ( ) Grapes ( )

5. Rank 1, 2, 3, and 4 the four fruits by value of production dollars in 1986. Rank as 1 the fruit with the highest dollar value; rank as 4 the fruit with the least dollar value.
   Apples ( ) Peaches ( ) Strawberries ( ) Grapes ( )

6. How many bushels of apples were produced in Ohio in 1986? To figure how many bushels of apples were produced in a given year, divide the number of pounds by 44. (Round off your answer to nearest hundred.)

7. How many bushels of peaches were produced in Ohio in 1976? To figure how many bushels of peaches were produced in a given year, divide the number of pounds by 48. (Round off your answer to nearest hundred.)

8. What two crops had the same number of pounds produced in a given year on the graph?

Name ______________________________

Fruit Crops – What Have You Learned?

1. Apples grow in almost every state in the U.S. Name one state where apple trees will not grow.

   ____

2. One weather condition that is extremely hazardous for Ohio fruit growers is ______________.

3. The top four fruits grown in Ohio, in terms of value of production are ______________________

   ____.

4. An apple developed in Ohio, and recognized as the official state apple by the apple industry is the

   ______________________________.

5. **True** or **False** (circle one) – A bushel of any kind of fruit weighs the same number of pounds.

6. An apple tree produces very little fruit until it is at least ________________ years old.

7. A fruit grower's harvest is not all profit. Typically, two costs of producing the crop would include

   ____.

8. **True** or **False** (circle one) – Growing different kinds of fruits in Ohio is a practice dating back to pioneer days.

Fruit Crops Key - **Food Production**

1. 1,200 bushels
2. 88 pounds
3. 39,600 pounds

Fruit Crops Key – **Understanding Graphs**

1. increased – 700,000
2. increased – 10 million
3. stayed the same – more than tripled
4. 1, 4, 3, 2
5. 1, 4, 2, 3
6. 2,045,500
7. 52,100
8. (1966) strawberries and peaches

Fruit Crops Key – **What Have You Learned?**

1. Hawaii, Alaska, Florida
2. Many possible answers: freezing temperatures, high winds, droughts, etc.
3. apples, peaches, strawberries, grapes
4. Melrose
5. False
6. 6
7. fertilizing, spraying, harvesting, weeding, etc.
8. True

Plants
Unit 21

Tree Farming

Background – Tree Farming

Forestry hasn't always been thought of as an agricultural interest. In fact, the U.S. Forest Service is a part of the U.S. Department of Agriculture. Forestry is an important industry in Ohio.

In 1788, 95% of Ohio's land was in forests, now about 27% or just over 7 million acres of the land is forests. Two small tracts of **virgin** timber remain in Ohio. Most of our wooded land is located in the hilly areas of Ohio, especially in the southeastern part of the state.

Tree farming is the practice of growing trees as a crop. We call the places where trees are grown, **tree farms**. Ohio has over 800 tree farmers who are raising trees to sell!

A Christmas tree farmer plants 4- to 6-inch **seedlings** and 8 to 10 years later harvests them. Seedlings are planted at the rate of 1,400 to 1,600 on an acre (approximately the size of a football field). Since most tree farms are not irrigated in Ohio, the weather is crucial for furnishing necessary water for this crop.

A tree farmer spends many hours caring for the crop, just like other farmers. Weeds and insects must be sprayed. During July, trees are **sheared** to shape them into perfect cones. Harvesting of the trees starts in November.

Lesson: **Tree Farming**

Resources:

Area forester to talk about tree farms. Worksheets.

Premise:

Trees play a vital role in the economic life of Ohio. Ohio's forests produce over $5 billion a year through logging and forest products.

Objectives:

1. Understand that forestry can be considered a part of agriculture.
2. Learn the process of Christmas tree farming.
3. Undertand the importance of forestry in Ohio.

Specific things to look for:

1. Students will realize the time involved in growing Christmas trees.
2. See how forestry is involved in agriculture.

Motivation:

How much do the students know?

1. How long does a Christmas tree grow before it is cut for your house?
2. Is forestry a part of agriculture?

Vocabulary:

1. Forestry – science of planting and taking care of forests
2. Virgin – original, untouched by man
3. Tree farm – a farm that raises trees for wood, posts, sawlogs or Christmas trees
4. Seedling – a tree usually not more than 18 inches tall, up to 4 years old
5. Sheared – a Christmas tree is shaped into the cone shape desired for Christmas trees

Trivia:

1. Ohio has nearly seven million acres of woodlands, the majority of which are privately owned.
2. Ohio has 1 national forest that covers 160,000 acres and 19 state forests that cover 200,000 acres.
3. The decorated Christmas tree has been traced back to the year 1500 in some of the European nations.
4. The most popular variety of trees grown for Christmas trees in Ohio is the Scotch pine.

Ag Unit: **Food and Fiber Core**
Major: **Science**
Minor: **Mathematics**

Related Lesson Plans

What Are Natural Resources?

Remarks/Notes

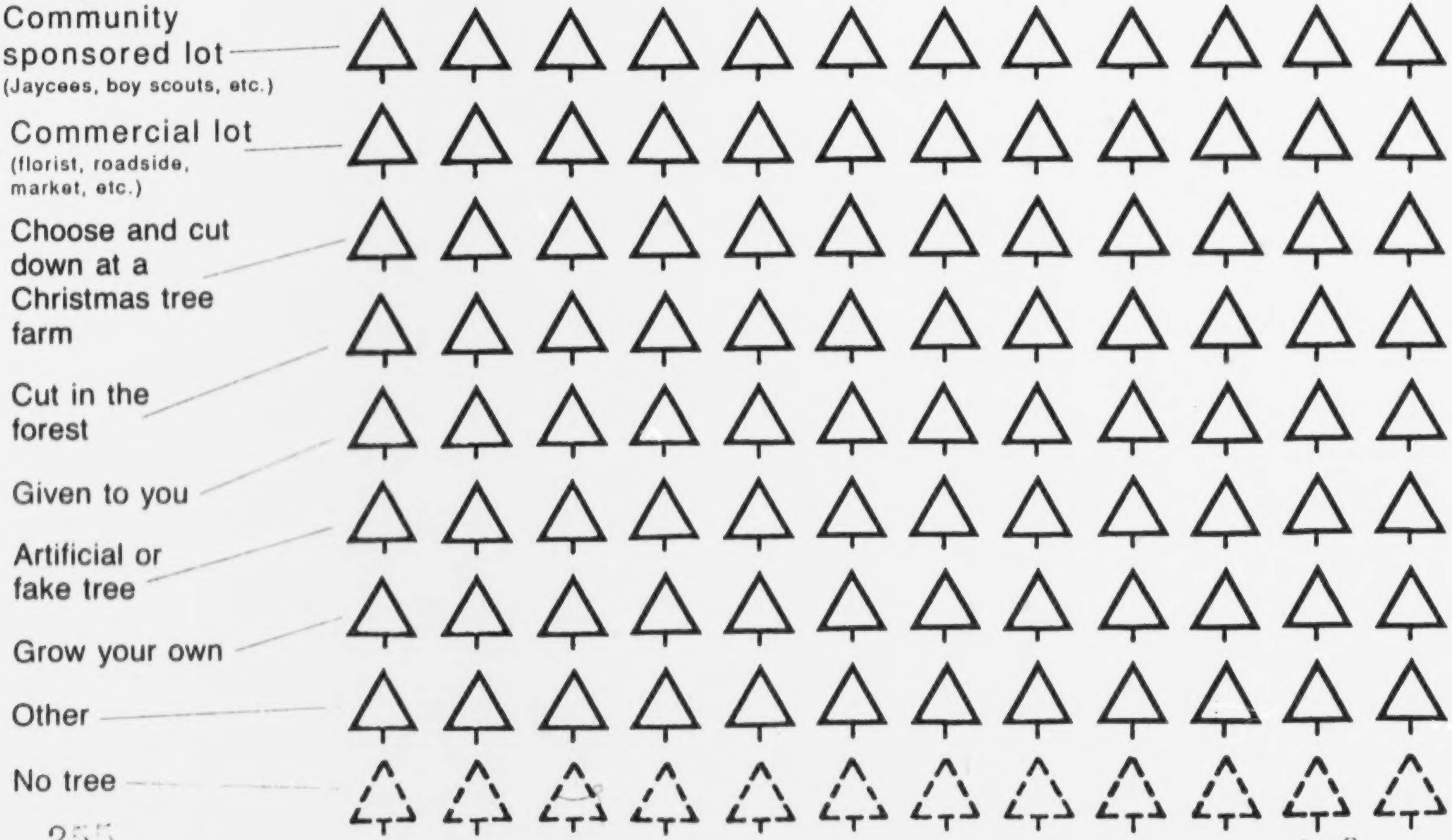
Suggested Activities:

1. Discuss how long a tree grows before it becomes big enough to be a Christmas tree (8 to 10 years). Ask the students how old they are in comparison.
2. A Christmas tree farmer raises trees. Have the students compare tree farming with the raising of another agriculture crop. (Graphs showing comparison of length of time to harvest could be compiled.)
3. Use the worksheet "Oh Christmas Tree" to graph out where the students get their Christmas tree. To do this, color in one Christmas tree for every student that answers "yes" to where they purchased their tree. Convert the answers to percentages and graph them. Discuss the results as if you were a Christmas tree grower interested in marketing your product.
4. List the different kinds of evergreens used for Christmas trees (Grand fir, Douglas fir, blue spruce, and Scotch pine).
5. Have students research history of decorating trees for Christmas.
6. Use the worksheet "Products from Trees" (page 6) to have students identify common products made from trees.
7. Invite a Christmas tree farmer or area forester to class and ask him/her to share knowledge about tree farming.

Oh Christmas Tree Graph

For each person who gave a response in a category, color in a tree. For example, if a person said, "We got ours at a tree farm," you would color in a tree for cutting down a tree at a Christmas tree farm.

Adapted with permission from "Get Oregonized."



Name ______________________________

Products from Trees

Over 5,000 products and by-products come from trees. Think about the things you use and see everyday. Fill in a product made from trees for each letter of the alphabet.

a. ____________________
b. ____________________
c. ____________________
d. ____________________
e. ____________________
f. ____________________
g. ____________________
h. ____________________
i. ____________________
j. ____________________
k. ____________________
l. ____________________
m. ____________________

n. ____________________
o. ____________________
p. ____________________
q. ____________________
r. ____________________
s. ____________________
t. ____________________
u. ____________________
v. ____________________
w. ____________________
x. ____________________
y. ____________________
z. ____________________

Name ____________________

Tree Farming — What Have You Learned?

1. How long does a Christmas tree grow before it is cut and harvested?
   a. 2 to 3 years
   b. 4 to 5 years
   c. 6 to 7 years
   d. 8 to 10 years
2. Shearing of a Christmas tree means:
   a. cutting off its top
   b. Harvesting the tree
   c. Making the tree into a cone shape
   d. Spacing the Christmas trees
3. Forestry is a part of agriculture.
   a. True
   b. False
4. Tree farming is very much like raising other crops.
   a. True
   b. False
5. Tree farming is growing trees as a crop.
   a. True
   b. False

Tree Farming Key – What Have You Learned?

1. d - 8 to 10 years
2. c - Making the tree into a cone shape
3. a - true
4. a - true
5. a - true

Tree Farming Key – Products from Trees

adhesives
barrels
bubble gum
cattle feed
charcoal
disinfectants
disposable diapers
explosives
fertilizers
furniture
gum
houses
ice cream
joists
knife handles
lumber
magazines
medicine
napkins
newspapers
oars
paper
pencils
quinine
rayon
skateboards
tape
tea bags
toothpicks
utensil handles
varnish
wallpaper
wagons
xylophone keys
yachts
zippers

Adapted from Florida Department of Agriculture and Consumer Services, "Plant a Tree for Life."

Animals

Unit	Title
22.	Beef Cattle
23.	Dairy Cattle
24.	Sheep Production
25.	Horses
26.	Swine Production
27.	Poultry Production

Beef Cattle

Background — Beef Cattle

The beef cattle industry in the United States is a big business. Each person in the United States consumes more than 50 pounds of beef each year, making the United States the world leader in beef consumption.

The first cattle were brought by the Spanish conquistadors when they landed in Mexico in the 16th century. These wild, rangy animals became the ancestors of the famous Texas Longhorn steers of the 1800's.

Some cattle producers buy calves and raise them to sell as steers. Other cattle producers are cow-calf operators. They keep a herd of cows and raise calves that are eventually sold.

Among the many breeds of cattle in the United States are Angus, Hereford, Charolais, Shorthorn, Limousin, and Simmental. Careful crossing of breeds and selection of desirable characteristics has created crossbreeds with greatly improved qualities for the cattle industry.

Beef cattle bulls (males) average approximately 2,000 pounds when mature. Cows (female) can weigh around 1,200 pounds depending on breed. Like humans, a cow is pregnant for 9 months. She will give birth to a 70- to 80-pound calf. The calf will nurse on its mother's milk until about 7-10 months of age. A female that has not given birth to an offspring is called a **heifer**. A male that has been **castrated** is called a **steer**.

A beef animal is a **ruminant**. This allows them to graze on roughage which otherwise would not be used by humans for food. In Ohio, cattle producers have fenced-in fields, called pastures, where cattle graze in warm months. Hay and corn silage provide roughage for the cattle in winter.

Once a calf is **weaned** from its mother, it will usually graze for one year. Then the calf is placed in a **feedlot** for fattening. Calves are usually weaned in late fall. By fall roundup time, they are 6 to 8 months old and weigh 400 to 600 pounds.

The cattle are fed in a feedlot until they are 20 to 25 months of age. Then they are ready for **slaughter** usually at a market weight of 1,000 to 1,300 pounds. For example, a 1,000-pound animal will dress out about 615 pounds for the retailer. The **retailer** must trim away about 183 pounds of fat, bone, and waste before the cuts are marketed at the counter. This would mean that a 1,000-pound steer will produce about 432 pounds of red meat. The body of a beef animal after it has been slaughtered is called a **carcass**.

The steer also produces a number of **byproducts**, both edible and inedible. Gelatin, marshmallows, candies, and sausage casings are some of the edible byproducts. Some inedible things we get are leather, surgical sutures, soap, cosmetics, buttons, sandpaper, and explosives. A beef steer also provides **pharmaceuticals** such as rennet, thrombin, insulin, estrogen, and thyroid extract.

It takes only a few minutes to buy a hamburger at your favorite fast food restaurant. But the steer from which that hamburger came is the result of approximately 2 years of beef production activities. Most Americans have eaten T-bone steaks, rump roasts, sirloin steaks, chuck roasts, pot roasts, and of course, hamburger. Beef is a popular American food. Barbecuing, or broiling over an open grill, is one of life's enjoyable activities. The next time you have a hamburger or a steak, think about the time it took to produce it.

Lesson: **Beef Cattle**

Resources:

Samples of body parts and worksheets

Premise:

Cattle production is a large industry in the U.S, including Ohio. Beef is eaten in larger quantities by Americans than any other red meat.

Objectives:

Students will learn about the growth and care required for a beef animal and how to recognize the importance of beef production in Ohio.

Motivation:

1. What is your favorite kind of meat?
2. Which of those just mentioned come from beef?
3. What are some of the products we use everyday that come from beef? (soap, candles, buttons, shoes, photo, film, etc. – see page 6).

Vocabulary:

1. Consume – eat
2. Heifer – female cow that has not produced a calf
3. Castrate – the process of altering or changing a male bull to a steer
4. Ruminants – animal with four stomach compartments, animals that chew their cuds
5. Weaned – to stop using mother's milk
6. Feedlot – place where cattle grow until butchered
7. Slaughter – butcher
8. Retailer – person who sells to customer
9. Byproducts – products made from animals other than meat
10. Pharmaceuticals – medicines

Ag Unit: **Food and Fiber Core**
Major: **Language Arts**
Minor: **Health/Nutrition**

Related Lesson Plans

Dairy Cattle

Remarks/Notes

Trivia:

1. The hamburger meat from an 1,100-pound steer would be enough for 30 children to have a hamburger every day for a month. (Note: Based on five hamburger patties per pound, an 1,100-pound steer would yield a usable carcass of 400 pounds. The carcass would yield 180 pounds of hamburger, 126 pounds of steak, 126 pounds of roasts and other miscellaneous cuts.)
2. Frank Menches of Canton claimed to have invented the hamburger during the 1880's. He was at a county fair and ran out of sausage for sandwiches, so he "ground some beef."
3. Cattle do not have upper front teeth. They eat by wrapping their tongue around grass and pulling it through their mouth. Back teeth are used for chewing.

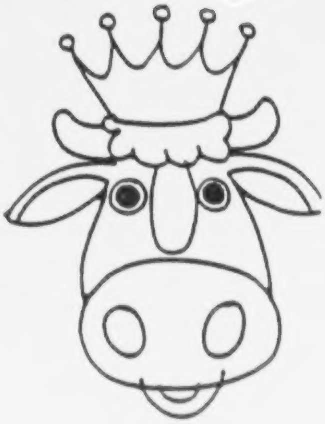
Suggested Activities:

1. If this unit is used near county fair time, students might visit the cattle barns and attempt to identify the breeds represented there.
2. Use the handout, "Introducing the Cattle King" (page 5).
3. "Cattle Have All the Extras" information sheet to be used by teacher or passed out to students (page 6).
4. Complete the Beef Crossword Puzzle (page 7).
5. "Life on an Ohio Farm Raising Beef Cattle" information sheet to be used for class discussion (page 9).
6. Students write a letter to a Beef Cattle Breed Association (see list in Reference Section) and request a photo of a breed. Depending on the size of the class, they may want to do this project in pairs. (Note: This activity can reinforce letter writing skills.)
7. Obtain samples of stomach lining, intestine, hooves, lungs, etc. from a slaughter house for students to examine.
8. Draw a large outline of a steer on poster board. Students bring samples of byproducts and attach them to the outline. Refer to "Cattle Have All the Extras" on page 6.

Introducing... The Cattle King

Beef cattle are among the most important farm animals. Each American eats an average of 53.8 pounds per year of roast beef, veal, hamburger, hot dogs and other beef products. American farmers sell more beef than any other product. So, beef cattle are truly the "kings" of the American farm.

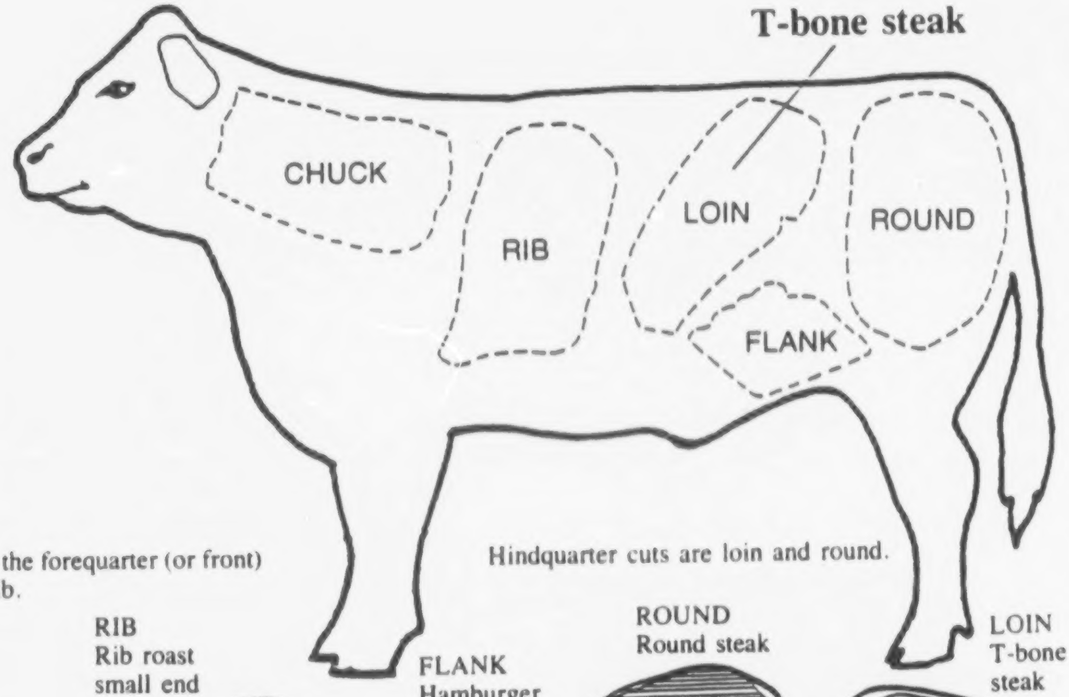
Who needs a king? We ALL need the Cattle King. Why do you think that we need him? (How many of your class said "for hamburgers?") Here is another important reason. About 83% of our land can't be used to grow crops for humans to eat. But grass that feeds cattle grows on almost half of that land. Without King Cattle, a great deal of our land could not be used to grow food.



Directions:

At the bottom of the page you will find some of the favorite "cuts" or kinds of meats that are obtained from cattle. Cut out each one and place it over the proper place on the outside of the beef animal where it could be found. Then re-label each cut to help you remember it. T-bone steak has been labeled for you.

Outside

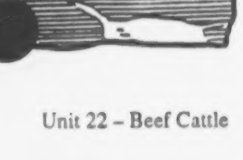


Inside

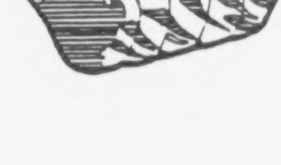
Major cuts from the forequarter (or front) are chuck and rib.

Hindquarter cuts are loin and round.

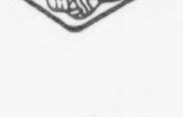
CHUCK
Arm pot-roast
or steak rib



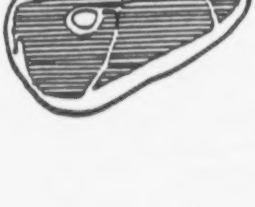
RIB
Rib roast
small end



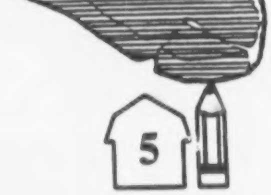
FLANK
Hamburger



ROUND
Round steak



LOIN
T-bone
steak



Cattle Have All The Extras

The byproducts and meat from a beef animal add tremendously to our quality of life.

432 pounds retail meat

- tenderloin steak
- ground meat
- sausage
- roasts
- bologna
- weiners

Variety meats

- liver
- tongue
- kidneys
- brains
- heart
- ox joints

Drugs

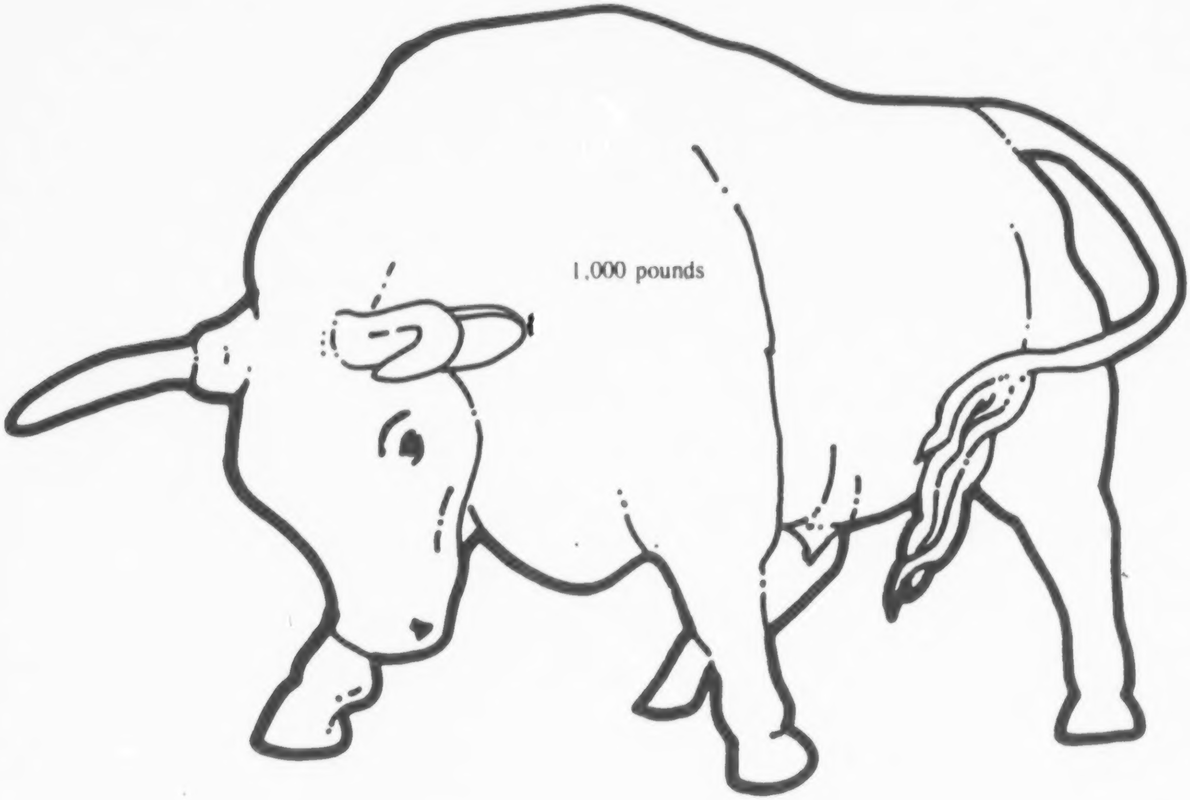
- insulin
- rennet
- epinepherine
- estrogen
- thrombin
- hormones

Edible byproducts

- gelatin
- marshmallows
- candy
- chewing gum
- canned meat
- natural sausage casings

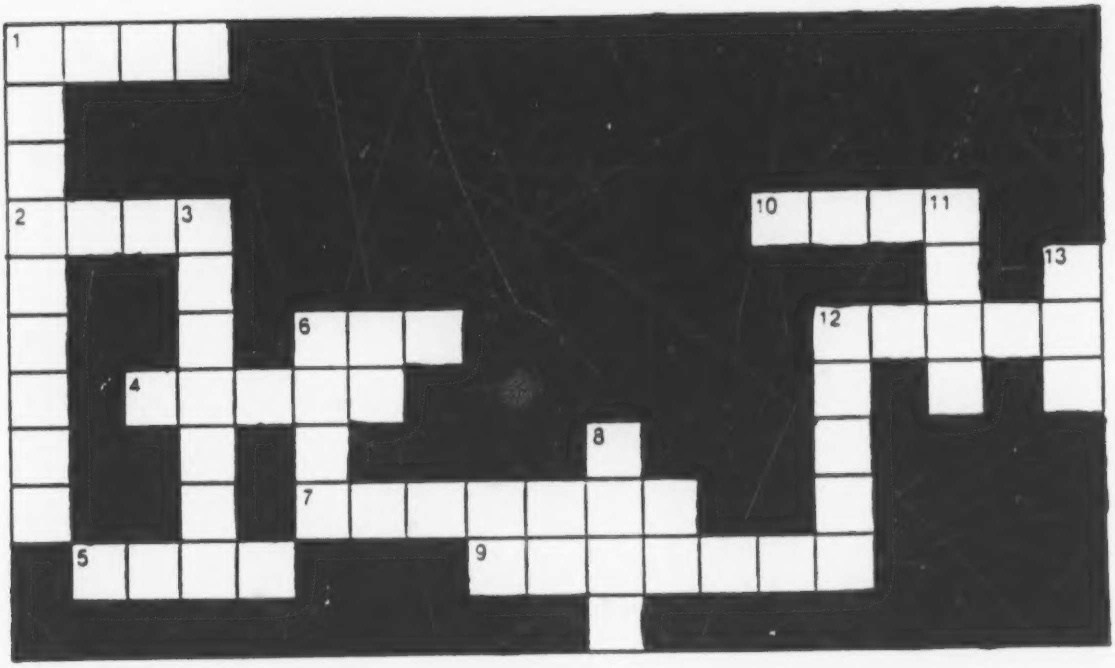
Inedible byproducts

- leather
- sports equipment
- soap
- glue
- cosmetics
- buttons
- bone china
- photographic film
- sandpaper
- violin strings
- surgical sutures



Name ______________________________

Beef Crossword Puzzle



Across

1. Natural protection on the head of some cattle
2. Male cattle
4. Most expensive meat of cattle
5. Group of cattle
6. Female cattle
7. Place where cattle are taken to be fattened for slaughter (hint: compound word)
9. The body of an animal after it has been slaughtered
10. Place where cattle are raised
12. How cattle eat in the field

Down

1. Ground beef made into patties
3. Product made from hides of cattle
6. Young of the cow
8. Major grain fed to cattle
11. Main product of beef cattle
12. What cattle eat while in a field or pasture
13. Color of fresh meat

Reprinted with permission from Clemson University's "Farm Animals – Their Products and Uses."

Life on an Ohio Farm
Raising Beef Cattle

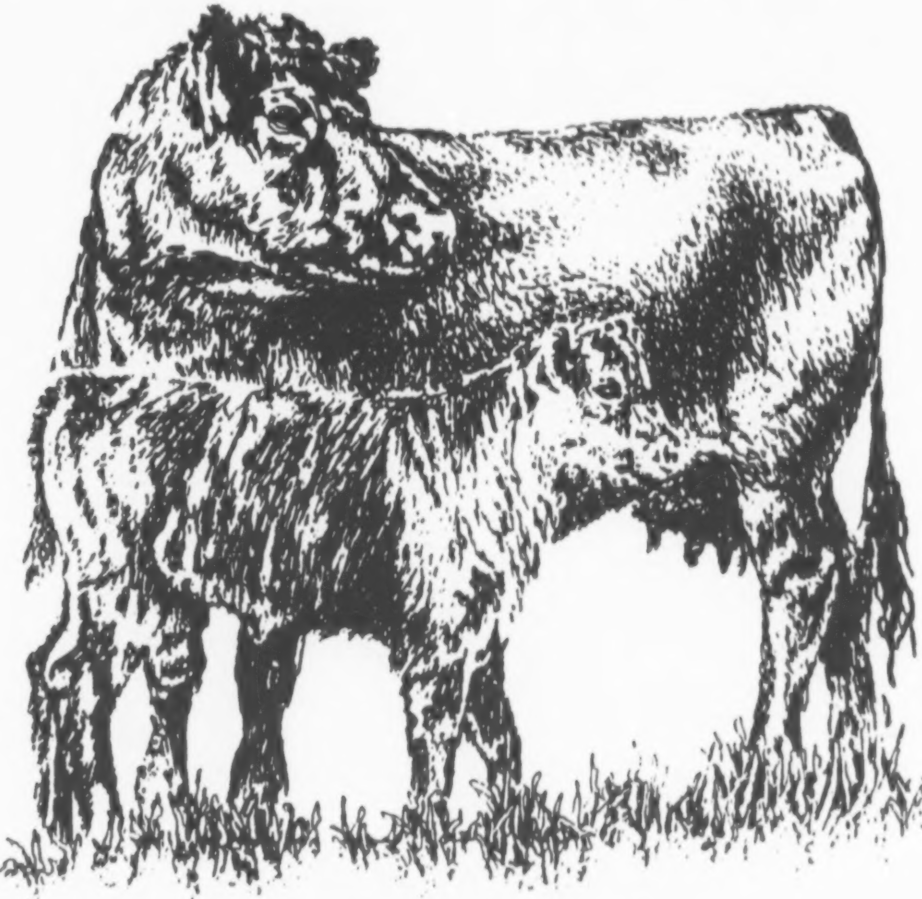
Larry decided to run out to the pasture to check on the calves. He learned yesterday a calf is what cattle are called that are under 1 year of age. A calf's mother is called a cow. A cow is pregnant for 9 months before giving birth to a calf. A calf can weigh 70 pounds at birth and will nurse on mother's milk until it is 7 to 10 months old. The farmer has to check often on the cow and calf to make sure they stay healthy and are well fed.

The farmer also gives the calves a series of vaccinations to prevent disease. The calf is branded and castrated if male. Male cattle that are castrated are called steers. The young female cattle are called heifers and the male cattle that are used for breeding are called bulls.

When the calf is 7 to 10 months old it is weaned from its mother. By this time, the calf can eat grass and drink water. Cattle have a four part stomach, unlike our one part stomach, that allows them to eat roughages like grass and hay and convert them to protein. Cattle can graze on land unfit to grow crops for human consumption and convert the grass into high quality protein.

At approximately 12 to 18 months of age, the calves are placed into feedlots where they will eat corn, silage (the whole corn plant finely chopped) and hay. The farmer also feeds them minerals and supplements.

At night the cattle sleep in barns. The barns are long buildings with open fronts to allow air to circulate. The buildings keep the cattle warm in the winter and provide shade in the summer. The cattle will stay on the farm for about 10 to 12 months or until they weigh about 1,100 pounds. The farmer will then sell the steers and heifers to a nearby market.



Adapted with permission from "Agriculture in Iowa."

Name ______________________________

Beef Cattle – What Have You Learned?

1. Name five kinds of meat we eat from beef cattle.

____

____

____

____

____

2. Name three byproducts of beef cattle that we eat.

____

____

____

3. Name three byproducts we don't eat.

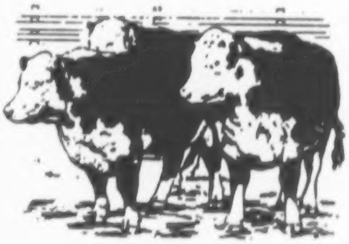
____

____

____

Word Bank

four
Mexico
ruminants
two
feedlot



4. Ancestors of beef cattle came from what country? ______________________________

5. Most cattle are fed to market weight in a ____________________.

6. From birth to market, a crop of beef takes ______________ years to produce.

7. From a 1,000-pound steer, there are approximately ____________ hundred pounds of red meat.

8. Beef, sheep and goats are ______________________________.

9. If you were a druggist or a doctor, what could you do with beef byproducts?

10. Write a story about your life without leather.

Name ______________________________

Worksheet: Beef

(Addition, Multiplication, Division)

1. Ten beef steers are being sent to market. Four weigh 1,000 pounds, three weigh 1,200 pounds and the rest weigh 1,100. What do they all weigh together?

__________ pounds

2. If the truck weighs 10,000 pounds when it is empty, how much does it weigh when the cattle are in it?

__________ pounds __________ tons

3. If the beef market is paying 50 cents per pound, how much will the producer receive?

$ ____________

Adapted with permission from *New York is Growing*, New York.

Beef Cattle Key – Crossword Puzzle

1 H	O	R	N															
A																		
M																		
2 B	U	L	3 L										10 F	A	R	11 M		
U			E													E		13 R
R			A		6 C	O	W							12 G	R	A	Z	E
G		4 S	T	E	A	K								R		T		D
E			H		L					8 C				A				
R			E		7 F	E	E	D	L	O	T			S				
	5 H	E	R	D				9 C	A	R	C	A	S	S				
										N								

Beef Cattle Key – What Have You Learned?

1, 2, and 3: Refer to resource page "Cattle Have All the Extras" (page 6) for products.
4. Mexico
5. Feedlot
6. 2 years
7. 4
8. Ruminants

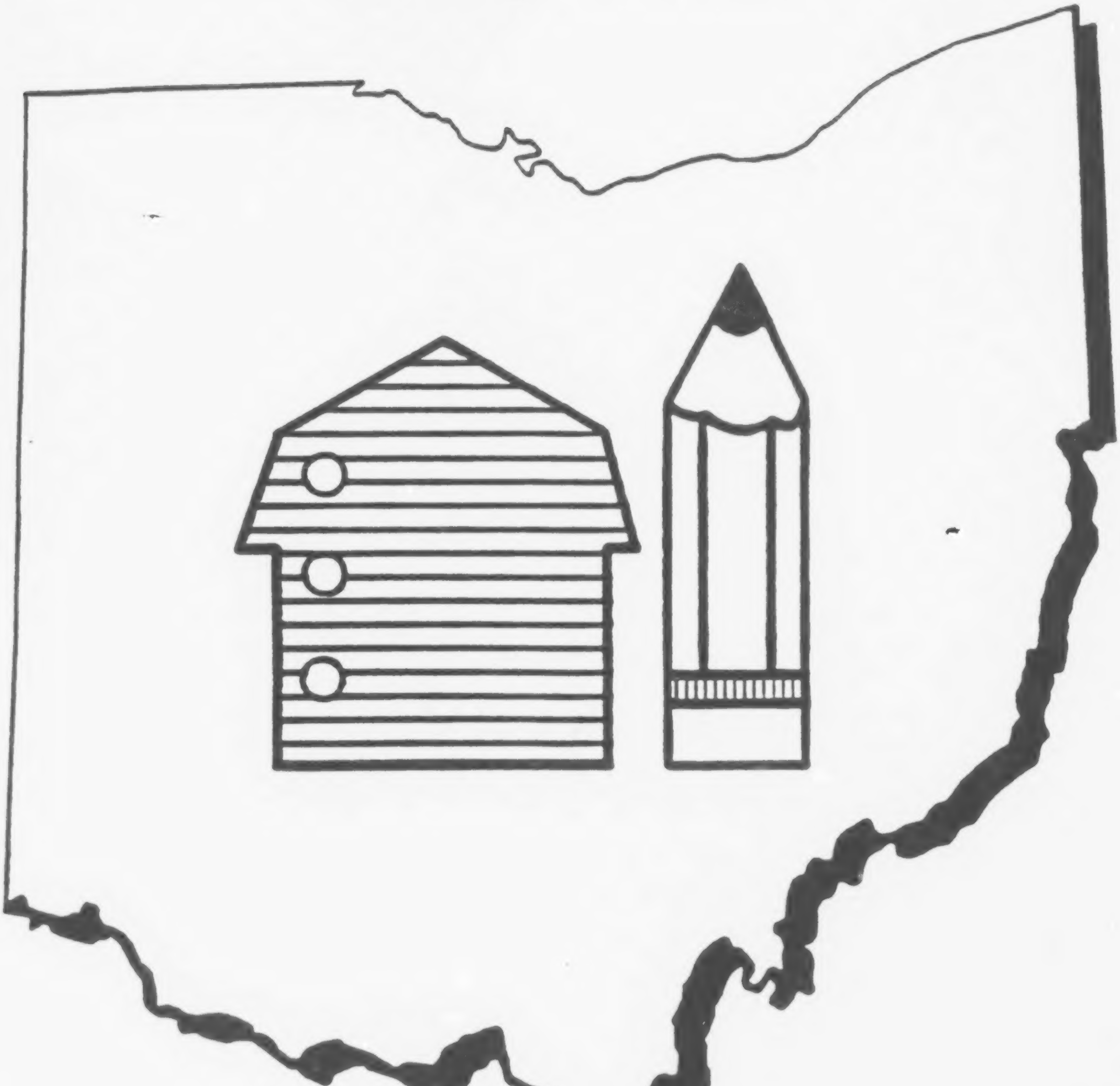
9 and 10: Answers will vary. Refer to "Cattle Have All the Extras" (page 6).

Worksheet Key – Beef Math

1. 10,900 pounds
2. 20,900 pounds, 10.45 tons
3. $5,450

Animals
Unit 23

Dairy Cattle



Background — Dairy Cattle

Dairying is important to Ohio. Dairy products are among our state's top 5 agricultural commodities. Ohio ranks first in the nation for most swiss cheese produced.

The dairy cow performs an important job in our food production industry. That job is changing grass and grain, which people can't eat, into milk — a nearly perfect food. The dairy cow is a **ruminant** as are beef cattle, goats and sheep.

The dairy cow eats 30 pounds of grain per day and a minimum of 20 pounds of alfalfa hay per day. Water is vital in a cow's diet. A cow drinks approximately 5 gallons of water for each gallon of milk she gives. A good Holstein-Friesian cow will produce approximately 6.25 gallons of milk each day. That would mean a cow would drink 30 to 40 gallons of clean, fresh water daily. A gallon of milk weighs 8.6 pounds. A cow usually produces milk about 10 months (305 days) which would calculate into over 16,400 pounds of milk per year.

Dairy cows come in many different breeds. Some of the common breeds in addition to the most common, **Holstein-Friesian** (black and white) are the **Jersey**, **Guernsey**, **Ayrshire** and **Brown Swiss**. A mature Holstein-Friesian cow will weigh approximately 1,500 pounds.

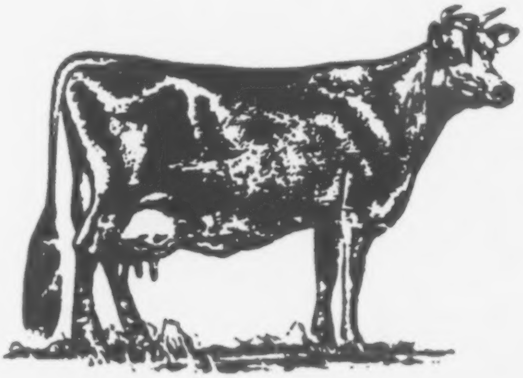
A cow will be old enough to breed when she is 14 to 19 months of age. A **heifer** is a female younger than 3 years old which has not had a calf. A male is called a **bull**. A castrated male is called a **steer**. A young animal is called a calf.

After having a calf, a cow begins milk production. They are usually milked twice a day — early in the morning and late in the afternoon. If a cow were to miss just one milking she would be in great pain. Dairy farmers simply do not miss a cow's milking, not even on a holiday! They are punctual on a daily basis, by the clock.

Most milking is done by machine. After the milk is taken from the cows, it is pumped through a clear plastic pipe to a refrigeration tank.

Special tank trucks pick up the milk and transport it to dairy plants where the milk is **processed** into the many different foods and dairy products which you buy in the grocery store.

Some milk products are low fat **skim milk**, half and half, yogurt, whipping cream, sour cream, ice cream, butter and cheese. The next time you have an ice cream bar think of where it originated.



Lesson: **Dairy Cattle**

Ag Unit: **Food and Fiber**

Core

Major: **Social Studies**

Minor: **Language Arts**

Resources:

1/2 pint of milk for each child plus 1 for demonstration, clay, plastic or rubber animals, buildings, and equipment.

Premise:

One of the most interesting places to visit at a farm is the dairy barn. Very few people go through life without relying heavily on dairy products. The dairy cow is an important farm animal.

Objective:

Students will learn the important facts about dairy farming.

Vocabulary:

1. Dairy — any activity connected with milk production
2. Ruminants — four stomach compartments, animals that chew their cud
3. Holstein — producer of largest quantities of milk, black and white breed
4. Jersey — brown cattle that produce milk with high butterfat content
5. Guernsey — tan to orange tan cattle that produce milk with high butterfat content
6. Heifer — young female animal
7. Bull — male cattle
8. Steer — castrated male cattle
9. Skim milk — butterfat removed
10. Processing — changing structure of product

Trivia:

1. One person can milk six cows by hand in about 1 hour. By using milking machines a person can milk 100 cows in 1 hour.
2. It takes a cow about 6½ hours to eat and drink all her food. That's longer than our school day.
3. Cows that eat grain and a ration (grain and supplement) may make 100 glasses (25 quarts) of milk a day.
4. The mold that flavors Roquefort is Penicillin.
5. Cheese was first made in Asia more than 4,000 years ago.
6. Ohio is the only place in the world where Liederkranz cheese is made.
7. Ohio ranks 1st in swiss cheese production, 3rd in cottage cheese, 5th in ice cream, and 8th in milk production in the United States.

Related Lesson Plans

Nutrition

The Start of Life – Life Cycle

Remarks/Notes

Suggested Activities:

1. The teacher conducts a discussion on these key questions:
   a. How many of you drink milk?
   b. What is milk? White liquid food.
   c. What do you know about milk?
   d. How do you think milk gets from cows to you?
2. Bring a half pint of milk to class for each student. Using the figure of a cow producing 6 gallons of milk per day and 16 half pints per gallon, how many children could 1 cow serve each day? (6 × 16 = 96 children)
3. Leave a carton of milk out on the window sill. Allow children to see (but not taste) the changes in milk. Lead into a discussion on the need for refrigeration from farm to market.
4. Make a model of a dairy farm from clay, plastic or rubber animals, buildings and equipment (available at variety stores and school supply houses).
5. Have the students list the things in their house that are made from dairy products.
6. Have the students write a short story about themselves on a dairy farm.
7. Sample different kinds of milk or cheese, or try cooking foods made from dairy products.
8. Many materials have been designed by the National Dairy Council to introduce students to the production, process and distribution of milk. They are available from:

   Mid East United Dairy Industry Association
   3592 Corporate Drive, Suite 114
   Columbus, OH 43231
   1-800-292-MILK

9. Use "Life on a Dairy Farm" (page 5) - a short description of a dairy farmer's day. This story could be read aloud, or duplicated and handed out for the children to read. Either way it will produce interesting class discussions.
10. Use "Which is Which?" (page 9) - an assignment that gives the class those activities that make a dairy farmer different from other farmers. (Note "key" page 10.)
11. Make a bulletin board. Enlarge the outline of a cow using an opaque projector on a bulletin board. Have students bring labels from dairy products to arrange in the outline.

Life on a Dairy Farm

The day on the Collins' dairy farm starts early. It is still dark and Sara, 14, and Mark, 11, are still asleep. Their parents are wide awake or, at least, awake. They are on their way to the milking parlor. In the pasture nearby, 80 cows are already lining up for the morning milking.

The milking parlor is a special building which allows the Collins' to milk 80 cows in about 2 hours. Mr. Collins turns on the lights. He sets a button which measures feed into bins, or big pans, in each milking stall.

Another switch opens the doors, and the first four cows enter the stalls. The cows walk up a ramp which has a built-in spray of water. The spray washes the cow's udders as they walk by, much like an automatic car wash.

Mrs. Collins washes the cow's udders with an iodine solution. Then she attaches milking cups to the cow's teats. With a flip of a switch, the milk flows through the tubes into a large glass jar. In 3 minutes the cow has given 30 pounds of milk. After the milk is weighed, the milk goes through glass pipes into a cooling tank.

The Collins' can milk eight cows at a time in their milking parlor. The whole herd can be milked in 2 hours. The milking parlor cost as much to build as a small house.

After milking, the cows go into a barn. There they finish breakfast. Cows eat silage, a mixture made of chopped corn stalks, ears and leaves. They also get some grain and hay.

By 7 a.m., the Collins' have cleaned the milking parlor. Then they have breakfast themselves. At 8:30, the milk tank truck arrives. It will carry the milk to a dairy company. The company will process, package and ship the milk to supermarkets. Some milk is made into ice cream, butter or other dairy products.

The dairy herd must be milked twice a day, 365 days a year. Cows never take a day off. It is hard for the Collins family to vacation as well. They sometimes hire workers to take care of the farm, so they can, on rare occasions, take a vacation.

After breakfast, the Collins' have other chores. They take care of sick or injured cows. Manure must be cleared. In warm weather, manure is spread on the fields. In winter, manure must be stored in barns or pits until spring.

The Collins' also grow corn and hay. They use most of their crop to feed their herd. Sometimes there is extra grain or hay. This is sold for cash. In a bad year, grain must be bought. So, depending on the season, the Collins' are planting, spraying or harvesting. They have machinery which helps them harvest the crops.

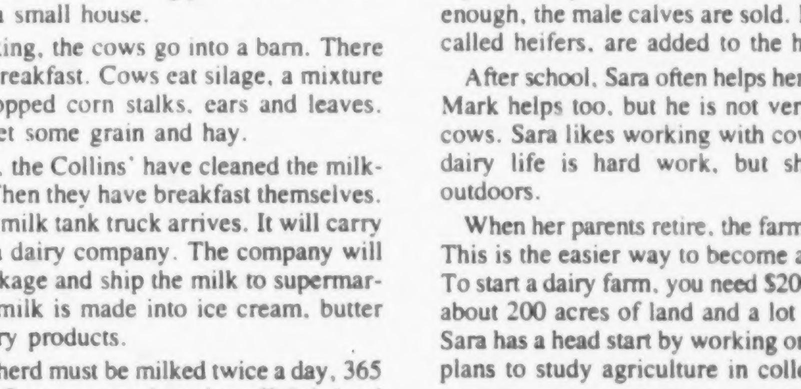
Mrs. Collins does most of the paperwork for the farm. She keeps track of weekly sales. Careful records are also kept of each cow's milk production. Cows give between 8,000 to 20,000 pounds of milk a year. Low-producing cows are sold. High-producing cows will be bred carefully. They are matched with bulls whose mothers were good producers. Careful breeding is why most cows today give twice as much milk as cows 25 years ago. Better feed is another reason. Farming practices have improved as well.

Cows must have a calf once a year or they stop giving milk. So the Collins' have a special barn for the cows to give birth. There is also a nursery for baby calves. When the calves are old enough, the male calves are sold. Female calves, called heifers, are added to the herd.

After school, Sara often helps her mom and dad. Mark helps too, but he is not very interested in cows. Sara likes working with cows. She knows dairy life is hard work, but she likes being outdoors.

When her parents retire, the farm could be hers. This is the easier way to become a dairy farmer. To start a dairy farm, you need $200,000 or more, about 200 acres of land and a lot of know-how. Sara has a head start by working on the farm. She plans to study agriculture in college.

By 7 p.m., the Collins' have finished the second milking. It has been a long day. Yet, the Collins family enjoys their life in the country, and Ohioans have fresh milk to drink because of them and others like them.



Name ____________________

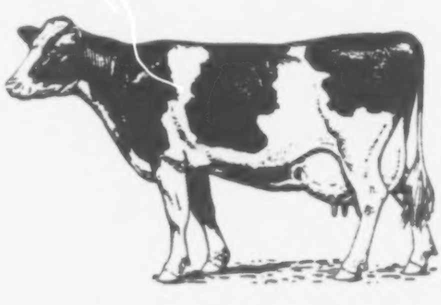
A Dairy Farmer's Story

Fill in the blanks in A Dairy Farmer's Story. Choose from the answers given in the box below and put the letter and words of the correct answer in the blank.

1. Hi! I am a dairy farmer. I have a herd of 160 cows. I have a ____________ that helps me and my son milk 8 cows at a time.
2. Before milking, the cow's udders are ____________________ to keep the milk clean.
3. Each cow gives about ________ pounds of milk each morning.
4. The milk company picks it up each day. They make some milk into butter and ______.
5. The cows eat grain, hay and ________________________.
6. I grow my own hay and ______________. This keeps me busy planting and harvesting.
7. Each year, every cow must have a ______________. If not, the cow stops giving milk.
8. I match each cow to a ____________________ whose mother produced a lot of milk.
9. Careful ________________ is one reason cows today give a lot of milk. Better feed is another reason.
10. Dairy farming is hard work. The herd must be milked ___ times a day. It's a good thing I like my job!

A. milking parlor
B. silage
C. two
D. calf
E. washed
F. corn
G. bull
H. breeding
I. 30
J. ice cream

Adapted from "Agriculture in Maryland," developed by the Maryland State Department of Education in cooperation with the Maryland Farm Bureau, the Maryland Department of Agriculture and the University of Maryland.



Answer Sheet
A Dairy Farmer's Story

1. Hi! I am a dairy farmer. I have a herd of 160 cows. I have a **(A) milking parlor** that helps me and my son milk 8 cows at a time.
2. Before milking, the cow's udders are **(E) washed** to keep the milk clean.
3. Each cow gives about **(I) 30** pounds of milk each morning.
4. The milk company picks it up each day. They make some milk into butter and **(J) ice cream**.
5. The cows eat grain, hay and **(B) silage**.
6. I grow my own hay and **(F) corn**. This keeps me busy planting and harvesting.
7. Each year, every cow must have a **(D) calf**. If not, the cow stops giving milk.
8. I match each cow to a **(G) bull** whose mother produced a lot of milk.
9. Careful **(H) breeding** is one reason cows today give a lot of milk. Better feed is another reason.
10. Dairy farming is hard work. The herd must be milked **(C) two** times a day. It's a good thing I like my job!

Name ______________________

Unit: Dairy Cattle

Worksheet (Part 1): Calf Profits

(Addition)

Melanie and Bob are brother and sister. They are each raising a dairy calf. A young female calf is called a heifer. After the heifers grow up, Melanie and Bob plan to sell them to another farmer and make a profit. Add up what it costs them to raise these heifers.

Melanie:	3-day-old calf	$100.00
	hay	120.00
	salt	1.00
	corn	25.00
	barley	200.0
	beet pulp	10.0
	medicine	12.00
	minerals	0.75
	equipment	60.00
	housing	10.00
	TOTAL	________

Bob:	3-day-old calf	$120.00
	hay	115.00
	salt with minerals	1.50
	corn	30.00
	soybean meal	220.00
	equipment	43.00
	vet bill	46.00
	housing	10.00
	TOTAL	________

Worksheet (Part 2): Making Money – The Dairy Way

(Addition, Subtraction, Rounding, Multiplication)

1. How much did it cost Melanie to raise her heifer, including the initial cost? ________
2. How much did it cost Bob to raise his heifer, including the initial cost? ________
3. If Melanie sold her heifer for $700, how much money did she make? ________
4. If Bob sold his heifer for $725, how much money did he make? ________
5. Who made the most money, Bob or Melanie? ______________
6. Bob and Melanie have decided that it would not take much more work to raise five heifers each. How much profit do they plan to make next year? (Round the profit to the nearest whole dollar before multiplying.)

Melanie ________________________ Bob ________________________

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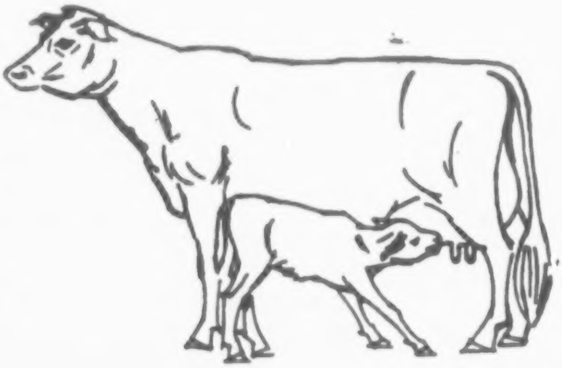
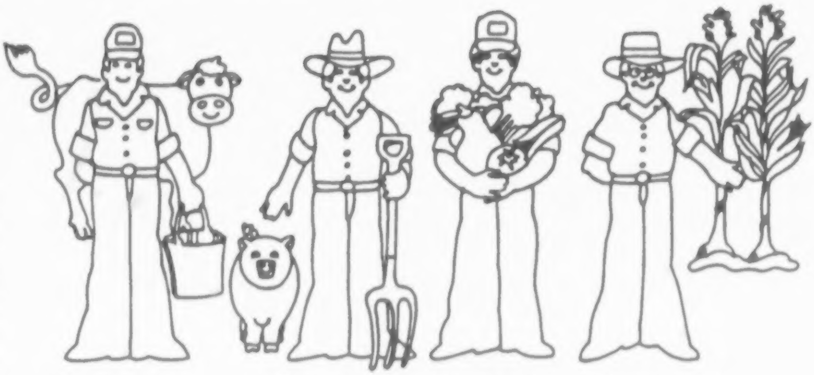


Name ____________________

Which Is Which?

You learned that there are four main kinds of farms in our country: dairy farms, farms that raise livestock or poultry, fruit and vegetable farms and farms where one or several grain crops are grown.

Not all farmers go through the same routine every day. See if you can match the activities listed below with the right farmer illustrated at the top of the page. There may be as many as four correct answers for some of the activities, and there may be just one. Place the number(s) you think are correct in the space next to the activity.



Farmer #1
Dairy

Farmer #2
Livestock

Farmer #3
Fruits and Vegetables

Farmer #4
Crops

__________ milks cows

__________ mends fences

__________ plants trees

__________ harvests wheat

__________ shears sheep

__________ feeds chickens

__________ bales hay

__________ plows ground

__________ operates a feedlot

__________ takes steers to market

__________ uses insecticides

__________ invests money

__________ grows soybeans

__________ collects eggs

__________ worries about weather

__________ depends on rainfall

__________ uses refrigerated transportation for his goods

__________ crates products

__________ uses fertilizer

__________ irrigates land

__________ uses a combine

__________ installs sprinkling systems

__________ trucks products

__________ calls a veterinarian

__________ needs a silo

__________ digs up potatoes

__________ feeds hogs

__________ plants seeds

__________ has a barn

__________ fights weeds

__________ listens to market news

__________ uses tank trucks

__________ worries about frost

__________ takes risks every year

Reprinted with permission from "Food for America," an FFA activity sponsored by American Breeders Service, Mobey Chemical Corporation, and J. I. Case.

Which Is Which? – Key

1	milks cows
1,2	mends fences
1,2,3,4	plants trees
4	harvests wheat
2	shears sheep
2	feeds chickens
1,2	bales hay
1, 2, 3, 4	plows ground
2	operates a feedlot
1,2	takes steers to market
1,2,3,4	uses insecticides
1,2,3,4	invests money
4	grows soybeans
2	collects eggs
1,2,3,4	worries about weather
1, 2, 3, 4	depends on rainfall
1,2	uses refrigerated transportation for his goods
3	crates products
1, 2, 3, 4	uses fertilizer
3	irrigates land
1, 2, 4	uses a combine
3	installs sprinkling systems
1,2,3,4	trucks products
1,2	calls a veterinarian
1,2	needs a silo
4	digs up potatoes
2	feeds hogs
1, 2, 3, 4	plants seeds
1, 2, 3, 4	has a barn
1, 2, 3, 4	fights weeds
1,2,3,4	listens to market news
1	uses tank trucks
3,4	worries about frost
1,2,3,4	takes risks every year

Worksheet (Part 1): Calf Profits – Key

Melanie: $538.75

Bob: $585.50

Worksheet (Part 2): Making Money the Dairy Way – Key

1. $538.75
2. $585.50
3. $161.25
4. $139.50
5. Melanie
6. Melanie $805, Bob $700

Name ______________________

Dairy Cattle — What Have You Learned?

Pick 2 out of 4 to write about.

1. List as many milk products as you can think of. Bonus points will be given for any extra products you can name over 10.

2. Tell how to make butter. Be sure to tell how the cream changes as butter is being made.

3. Pretend you are visiting your grandfather's farm. He still milks a few cows by hand. Write a story about the way you have helped your grandfather at chore time.

4. Later in the summer you visit Aunt Betty and Uncle Bill's dairy farm. Write a story about the things you must do to milk dairy cows that differ from your grandfather's way.

Animals
Unit 24

Sheep Production

Background – Sheep

Sheep originated in the mountains of central Asia and were tamed and raised in that area thousands of years ago. The ancestors of the sheep today were wild sheep that looked much like goats.

Sheep belong to the family of hollow-horned **ruminants**. Ruminants have four-compartment stomachs. Because they are ruminants, sheep are able to digest feed (grass and hay) that is more coarse than anything humans eat. Cattle, goats, and deer are also ruminants.

Sheep are produced for meat and wool. The meat is used for the food we eat, and the wool is used for the clothing we wear. Ohio ranks 14th in the U.S. in its number of sheep and lambs. Sheep are timid animals that live in flocks. They copy one another and often eat facing the same way – always with the wind blowing toward them. Domestic dogs are the number one predator of sheep.

More than 200 breeds of sheep are in the world today. In the midwest United States, the most popular purebred breeds are Suffolk, Hampshire, Dorset, Columbia, Rambouillet, Shropshire, Cheviot, and crosses of these.

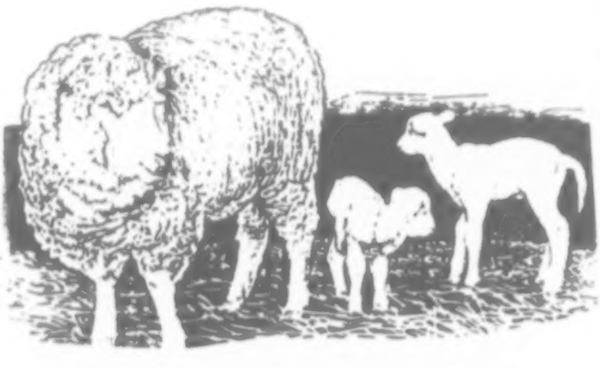
Rams (the male sheep) are turned with the **ewes** (the female sheep) for breeding in late summer or early fall. Most of the breeds of sheep do not breed out-of-season; therefore, only one crop of lambs can be raised each year. The Polypay is a breed developed for twice-a-year lambing.

Ewes usually produce 1 to 3 lambs at birth. Twins are common and preferred by sheep producers. The newborn lamb may weigh 8 to 12 pounds at birth. In approximately 5 months the lamb weighs 100 to 125 pounds and will be ready for slaughter. Mature rams can weigh 225 to 300 pounds, and mature ewes can weigh 150 to 200 pounds depending on the breed.

Each spring the ewes and rams must be sheared. Wool is a valuable agricultural product. The wool taken from one sheep is called a **fleece**. The average fleece weighs 6 to 8 pounds. When it is removed, it is carefully folded together into a fluffy roll and tied with twine. The grower packs all the fleeces into large burlap bags and hauls them to market.

When the ewes lamb in the spring, the sheep producer must carry out several management practices. First, the lambs must be vaccinated for some common sheep diseases in the Northwest. It is a good practice to identify the lambs with eartags soon after birth. Also, it is a good practice to **dock** the tails of lambs. Docking (removing the tail) aids the appearance and the cleanliness of the lambs. Ram lambs are usually castrated. Wethers (casted males) are easier to handle than ram lambs, and they can be kept with the ewe lambs. Wether lambs finish more quickly and usually bring higher prices than ram lambs.

To remain in business, the sheep producer must produce the kind of lamb that the consumer wants to buy. The lamb must be sold at the correct weight so the carcass will have a high percentage of lean meat and a low percentage of fat. This will result in the desirable cuts of meat at the supermarket.



Lesson: **Sheep Production**

Resources:

Cut-Apart Art. Animal study with a color coded research outline.

Premise:

The sheep is an animal often loved by children, especially the newly-born lamb. The sheep industry is an important agricultural industry in Ohio and the United States.

Objectives:

Students will learn about the growth and care of sheep.

Specific things to look for:

1. Sheep industry provides meat and wool.
2. Lambs require certain care — vaccination, tagging, docking and shearing.

Motivation:

1. How many of you have ever worn anything that came from a sheep?
2. What was it?
3. Have you ever eaten lamb meat?

Vocabulary:

1. Ruminant – four stomach compartments
2. Purebred – one certain breed
3. Ram – male sheep
4. Ewe – female sheep
5. Fleece – wool sheared from a sheep
6. Dock – remove tails
7. Domestic – tame

Trivia:

1. A good sheep will produce an average of about 8 1/2 pounds of wool. This is more than enough to make a three-piece suit for your father.
2. Sheep love to eat weeds.
3. Expressions:
   "Wolf in sheep's clothing
   "Meek as a lamb"
   "Two shakes of a lamb's tail"

Ag Unit: **Food and Fiber Core**
Major: Social Studies
Minor: **Language Arts**
Mathematics

Related Lesson Plans

Beef Cattle — Ruminant Diagram

Remarks/Notes

Suggested Activities:

1. Students should discuss why the sheep industry is more important in the western range states. Teachers may draw an outline of the U.S. on a chalkboard and have students draw where 3/4 of the sheep are raised.
2. During lambing season, invite a farmer who raises sheep into class. Have him/her bring a couple of lambs to class and explain what some of the activities are during lambing season.
3. Teacher organizes a field trip to a local supermarket where the class can discover and identify products that come from sheep.
4. Students can bring ingredients for a lamb stew: lamb, onions, garlic, peppers, carrots, and potatoes. Cook the ingredients in a crock pot to make a tasty lunch.
5. Invite a sheep shearer to demonstrate shearing.
6. Have students bring samples for a wool display. Examples are articles of clothing, blankets, pelts (if available) and other leather products.
7. Have the students recall nursery rhymes about sheep: Mary Had a Little Lamb, Little Bo Peep, Little Boy Blue and others.
8. Directions are included on the following activity sheets:
   Cut-Apart (page 5)
   Animal study (pages 6 and 7)
   Sheep Shearing and How Much Do You Pay? (Mathematics Worksheets)
9. Pictures of several sheep for students to realize that sheep come in many different shapes and sizes (page 8).

Cut-Apart Art

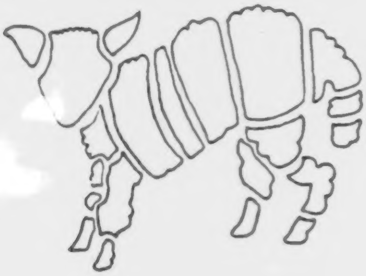
Supplies:
scissors
white paper
black paper
pencil
black marker (fine point)

Introduction:

This activity could be used with any of the livestock animals found in Ohio today.

Procedure:

1. Using a pencil, draw a picture of a sheep on white paper. It may be realistic or an imaginary sheep.
2. Trace over the drawing with black marker.
3. Cut this drawing apart and reassemble on black paper leaving space between the parts.



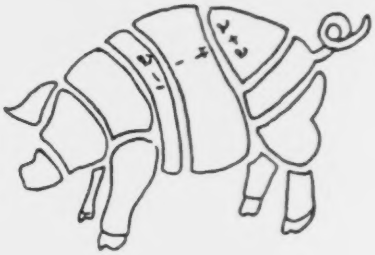
Cut-Apart Math Art

Introduction:

This is a fun and creative way to reinforce addition, subtraction, multiplication or division skills and art.

Procedure:

1. Repeat steps 1 and 2 of Cut-Apart Art.
2. Divide the sheep up like a puzzle.
3. Place math problems on the dividing lines. Place the problems on one side of the line and the solution on the other so that matching them will solve the puzzle.



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Animal Study with a Color Coded Research

Outline Supplies:

Animal study
Color code outline
Crayons or markers

Introduction:

Organizing facts is a difficult process for most students learning to research. The color coding procedure described here may help the students better organize their facts into a written report.

Procedure:

1. Review the outline discussing the various topics and subtopics.
2. Using various reference books and encyclopedias, research your animal and try to locate facts in each of the five topic areas. Place the information on the paper as separate numbered facts. You may wish to have them skip lines between each fact.
3. Now you're ready to color-code the outline. As a class, decide the color of each topic, and color the cattlehead accordingly.
4. Once all the facts have been gathered, you are ready to color-code your facts. For example a fact might be: Corn is an important food for hogs. (This fact would belong under topic II, **What Does It Eat**. Suppose the color for topic II is **RED**, the child would place a red mark in front of this fact.
5. Continue color-coding all of the other facts according to their topic colors.
6. Once all the facts have been color-coded, the child groups the facts together according to their color. All the **RED** facts could become an interesting paragraph about what the animal looks like.
7. The facts for each topic (color) would then become its own paragraph.
8. Depending on the age and abilities of your researchers, the number of facts gathered will vary. Ambitious students may find they need to make more than one paragraph out of a particular topic (color).
9. Encourage your students to:
   - use complete sentences
   - spell correctly
   - punctuate appropriately
   - write with expression
   - encourage interjection of opinions
   - distinguish facts from feelings
   - make it interesting

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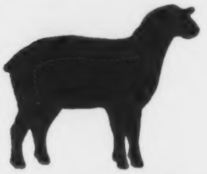
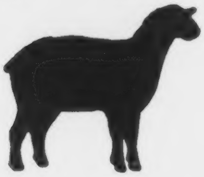
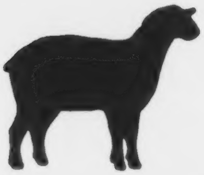
Animal Study with a Color Coded Research Outline



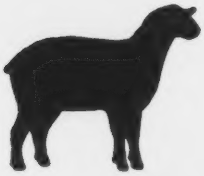
1. What does your animal look like?
   color
   size
   shape
   length
   weight
   life span
   distinguishing feature
   personality
   What other animal does it most resemble?



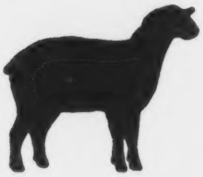
2. What does it eat?
   How does it get its food?
   Where does it get its food?
   How often does it eat?
   What does its diet consist of?
   What place does it have in the food chain?



3. What kind of environment does it live in?
   How does it use its home?
   What is its home made from?
   Do seasons alter its lifestyle?
   What other region of the world does it prefer?



4. Is this animal a friend or foe?
   Who are its enemies?
   Who are its friends?
   Is this animal endangered by man?
   What kind of reputation does it have?
   Does any unique symbiotic relationship exist?



5. Usual or unique characteristics:
   strange habits
   special adaptations
   myths and legends
   true tales

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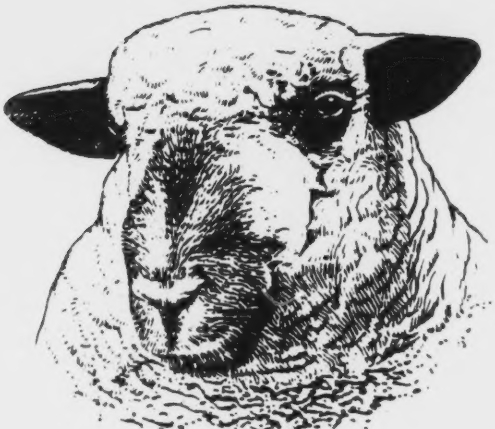
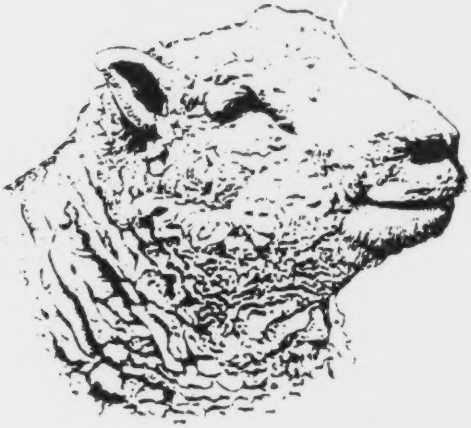




Unit: Sheep Production,

Name ____________________

Worksheet: How Much Do You Pay?

(Addition, Subtraction)

Please show your work:

1. You bought a sheep for $36.00, a pig for $75.00 and a cow for $300.00. How much did you pay for all three?

____

2. The sheep was sold a week later for $40.00. How much profit did you make on the sheep?

____

3. The cow had a calf. You sold it a year later for $200.00. How much did you still owe on the cow?

____

4. The cow had another calf this year, you fed the cow $180.00 worth of feed, and you fed the calf $20.00 worth of feed. How much did it cost all together?

____

5. For how much do you have to sell the calf to finish paying for the cow and pay the feed bill too?

____

6. The pig ate $100.00 worth of feed. Then he died. How much do you owe for the pig and his feed?

____

Reprinted with permission from "Agriculture in Montana Schools," Montana

Name ____________________ **Unit: Sheep Production**

Worksheet: Sheep Shearing

(Multiplication, Division)

It is sheep shearing time. You have 50 ewes and 2 rams. Please show your work.

1. The shearer charges $1.50 per head. How much must you pay him to shear your ewes and rams?

____

2. The shearer also charges mileage at 20 cents per mile and he lives 40 miles away. How much is the mileage charge?

____

3. When you sell your wool you get 520 pounds of wool. How much wool did you get from each sheep?

________ pounds

4. You get paid $1.10 per pound of wool. How much did you make on the wool?

____

5. You had burrs in your wool, so the wool buyer deducts 2 cents per a pound. How much does he take off?

____

Reprinted with permission from "Agriculture in Montana Schools," Montana

Name ____________________

Sheep Production — What Have You Learned?

Match each word with its definition:

1. Ruminant
2. Fleece
3. Dock
4. Suffolk, Hampshire, Columbia
5. Wool

a. wool sheared from a sheep
b. remove tails
c. breeds of sheep
d. fabric
e. An animal with a four compartment stomach

Word Bank

Use the following words to fill in blanks 6, 7, and 8 in the following statement:

meat
docked
tagged
dogs
vaccinated
wool
domestic

6. Newborn lambs must be ______________, ______________ and ______________ for identification.

7. ____________________ are predators of sheep.

8. ______________ sheep are produced for ______________ and ______________.

9. Pretend you are a shepherd. Tell about your home and your care of newborn lambs.

____

____

____

____

____

____

____

____

____

Sheep Production Key – What Have You Learned?

1. f
2. d
3. a
4. b
5. c
6. e
7. docked, tagged, vaccinated
8. coyotes
9. domestic, meat, wool
10. Answers will vary:
    I would come from a province in Spain. My home would be a wagon. I would work for a rancher who may own several thousand sheep.
    I would dock the newborn lambs and eartag them for identification. I would vaccinate them for diseases.

Worksheet Key: How Much Do You Pay?

1. $411.00
2. $4.00
3. $100.00
4. $200.00
5. $300.00
6. $175.00

Worksheet Key: Sheep Shearing

1. $78.00
2. $16.00
3. 10 pounds
4. $572.00
5. $10.40

Horses

Background – Horses

For nearly 200 years, the horse was our only supply of "horsepower" on the farm. Until we developed the tractor in the early 1900's, the work horse supplied the power to pull farm implements over every acre of soil we planted.

Horses were first brought to this country by the Spanish explorers. Many of them escaped from captivity and ran wild throughout the western states. Native American Indians soon found them useful for both hunting and transportation. As settlers came to America, the horse was depended upon for transportation, to pull heavy wagons, and to help clear the land and plow the fields. Often they provided the only link between settlements and towns. "Pony Express" riders carried the mail. Even after our railway systems developed, they were still our most popular means of transportation. Our early street cars and fire engines were also "horse powered."

Today's farms depend on heavy machinery to do the work that once was done by horses, but horses are still important in agriculture. On many ranches in the American West the horse is still used to rope and brand cattle, and to carry cowboys through rough country while rounding up the herd.

Today, in large cities like Columbus, horses are used by police to help them patrol busy areas. Horses used in this way are carefully trained to work in noise and heavy traffic. They learn to step aside to let cars pass and can move close to crowds without hurting anyone.

Horses are also used for recreation. Many people ride horses for pleasure and in rodeos. Trained horse acts in the circus are still popular. Two sports, polo and horse racing, use horses which are bred and trained specifically for that purpose.

The **quarter horse** is usually thought of as a western horse and is the kind still used by ranchers. It's also used for pleasure riding and is by far the most popular breed of horse in this country. Its name comes from its speed in quarter-mile races.

The **Standardbred horse** is the kind bred and trained for all types of harness racing. In harness racing the horse pulls a special type of light-weight two-wheeled cart called a "sulky." Drivers control the horses with long reins. Standardbreds are trained to be either "trotters" or "pacers." Trotting is a natural gait, with the legs moving together in diagonal pairs (i.e., right foreleg with left hindleg). Pacing must be taught to horses; in this gait they move both legs on the left side, and then both legs on the right side together.

Standardbred racing is very popular in Ohio. There are about 2,800 trotting horses alone registered in the state, and you can find them at most of the county fairs and several racetracks. The Delaware County Fair is also the site of the most important race in the U.S. for pacers – "The Little Brown Jug." The horse that wins this race will earn hundreds of thousands of dollars for its owners throughout its racing career.

Most **Thoroughbred** horses also begin their careers on the racetrack. This breed originated in England, and is the breed most often used for "flat" racing in the United States. They reach a top speed of 45 m.p.h. – their tiny jockeys must hold on very tightly! The Thoroughbred is also suitable for most other kinds of pleasure riding, and it makes a superior hunter or jumper.

Arabian horses are small and very beautiful. Although usually used as show horses, surprisingly they are also the most likely choice for long-distance or "endurance" rides (often 100 miles per day). Despite its delicate appearance, the Arabian's desert breeding gives it a great heart and willingness to keep going against all odds.

Horses that do heavy work are called **draft horses**. They originated during medieval times when knights in heavy armor needed a very sturdy animal to carry them around. Later they found use on the world's farms. Today many draft breeds still remain popular, including the **Clydesdale**. You would recognize Clydesdales as the famous brown, black, and white horses who pull beer wagons in T.V. commercials and parades.

Some horses have names which indicate their color or markings rather than their breed. This includes lovely golden **Palominos**, and spotted **Pintos and Appaloosas**. Pintos have big colored patches; Appaloosas have little speckles all over their body or a white "blanket" with spots on their rump.

Although they are smaller, ponies are not horses that didn't grow up! There are many separate and distinct breeds of ponies. Ponies are always 14 1/2 "hands" or less tall. A hand is equal to 4 inches; all horses and ponies are measured that way from their "withers" - the hump at the base of their neck - to the ground.

One of the most popular breeds of pony in the United States is the **Shetland** which is used for every type of riding and also will haul children in a cart or sleigh. Many pony breeds including the Shetland originated in England. But America can claim the perky little **Hackney** who shows off his high-stepping while pulling a fancy carriage.

Horses still run free today across the plains in many western states. But the majority of American horses and ponies live comfortably with doting owners who keep them in a stable. A stable is designed to keep horses happy and healthy when they can't run wild.

When a horse is in the field he spends most of the day eating. But grass alone is not nutritious enough for a horse, and his feed must be supplemented with high-energy grains such as oats and corn. In addition, he is fed quality hay for added protein, which is put in a haynet so it won't get trampled on the floor. Finally, he needs lots of clean, clear water – up to 10 gallons a day!

Horses can travel up to 18 1/2 miles (30 kilometers) a day in the wild. Even domestic horses need daily exercise or they become bad tempered and stiff. A horse is usually kept by itself in a stable, since horses kept together may compete for food.

A horse must also be groomed regularly to keep its coat clean. Natural oil in the horse's coat keeps the horse warm and dry; in cold weather, most horses grow longer coats for added protection. The forelock and mane grow all the time like human hair, and help to protect the horse against flies. The tail also grows constantly and is used to swish flies away.

A horse's front teeth never stop growing either. They are continually worn down when the horse eats. The front teeth are used for cutting grass and the back teeth for chewing it. A horse's age can be determined by the length and shape of its teeth.

Horses' teeth are called hooves and have a hard outer layer which grows like our nails do. In the wild, this wears down gradually. The hooves of working horses are protected from hard surfaces by being trimmed and fitted wth metal shoes.

Horses turn their ears toward any noise they hear. When the ears of a horse are pricked forward, it usually indicates friendliness and curiosity. Ears laid back generally indicate fear or anger. Horses can also see partially behind them without turning their heads. If a horse is frightened or angry, it will open its eyes wide, showing the whites.

Horses rest mainly standing up, with one of their hind hooves tipped up to rest the leg and their eyes half-closed. They also spend some of their rest time lying down.

From the time a **mare** is bred, it requires about 340 days before the baby horse is born (gestation/pregnancy). A young horse is called a **foal** until it is about a year old. A male foal is a **colt** and a female is a **filly**. When it is a year old, a colt will be castrated if it is not going to be used for breeding. It is then called a **gelding**. A non-castrated male horse is called a **stallion**.

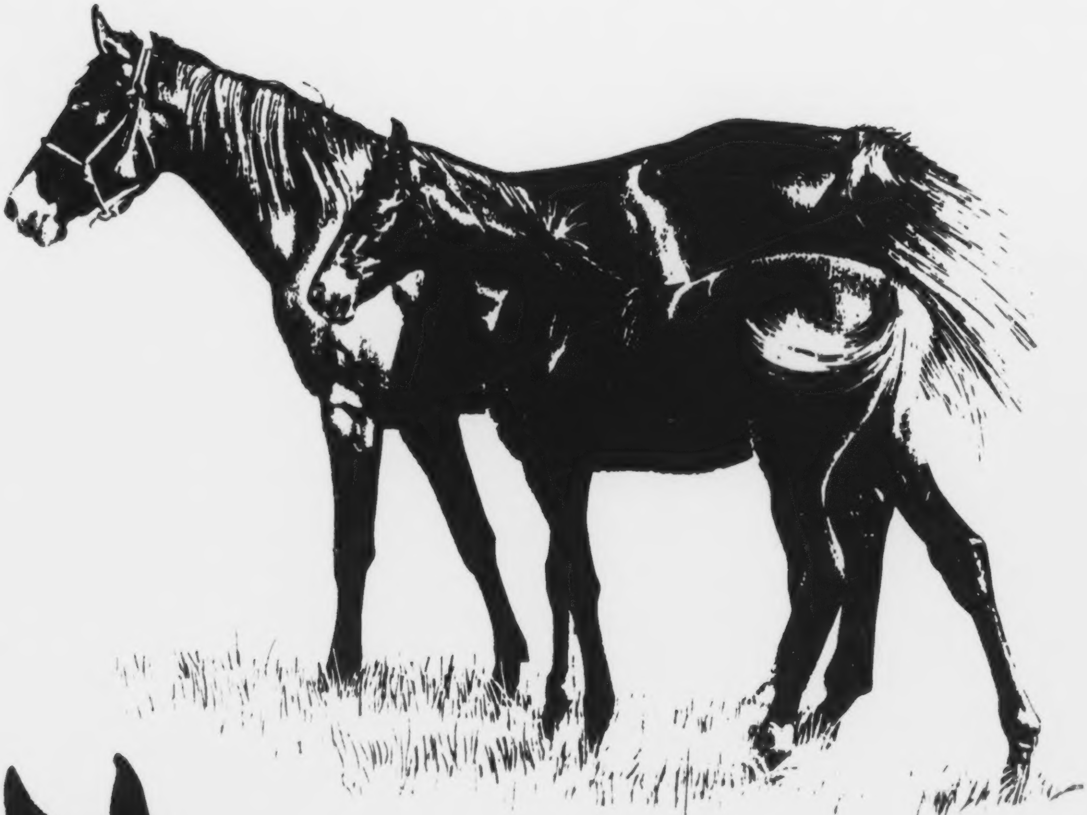
If farmers had to rely on horsepower to produce food, our nation would need 20 times the number of horses alive today, five times the number of farm workers and grain prices would increase more than 50 percent. Using horses could reduce the farmers' need for fuel, but going back to the "good old days" would be costly and next to impossible.

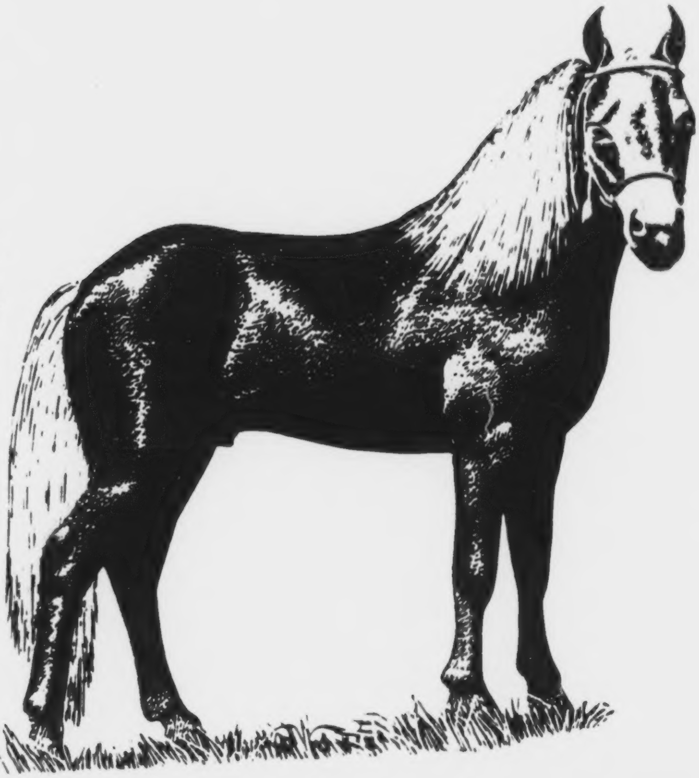
In fact, using horses would reduce the amount of land available on which to grow food for human consumption and feed for red meat production by one-fourth. This would also cause food prices to go up.

With the number of horses available for reproduction purposes today, it would take about 25 years to breed enough horses to do all the farm work. And, as in the 1920's food production using horses also would require nearly a fifth of the total United States work force.

Cost records in 1920 show that two men and eight horses were required to farm 160 acres. Typically today, one farmer can handle over 400 acres - at least five times as much.

Adapted with permission from the Illinois Farm Bureau.





Lesson: **Horses**

Premise:

Horses are used extensively in Ohio and around the United States for both work and pleasure.

Objective:

Students will understand the importance of the horse in our history and today.

Specific things to look for:

1. Know six uses of the horse.
2. Know why the farmer uses tractors today instead of horses to pull farm equipment.
3. List what horses eat.
4. Be able to tell what the horse uses its mane for.

Motivation:

Discuss with the students what they know about horses.

1. How many of you have ever ridden a horse?
2. What comes to your mind when you hear the words "horse racing?"
3. What does a horse eat?
4. What do you call a baby horse?

Vocabulary:

1. Quarter horse - a western horse popular for ranching, rodeos, and pleasure riding.
2. Standardbred - horses used as trotters or pacers in harness racing; popular in Ohio.
3. Thoroughbred - breed most often used for flat racing in the United States; also for pleasure, hunting and jumping.
4. Arabian - ancient breed used for showing and endurance rides.
5. Draft horse - large, sturdy animals used for heavy work and pulling.
6. Clydesdale - familiar breed of draft horse in the United States (*Budweiser* beer horse).
7. Appaloosa - colored breed famous for its spots and white blanket on rump.
8. Shetland - popular pony breed used for riding and pulling
9. Mare - a mature female horse
10. Foal - colt or filly less than 1 year old
11. Colt - a male foal
12. Filly - a female foal
13. Gelding - a castrated male horse
14. Stallion - a mature male horse

Ag Unit: **Food and Fiber**

Core

Major: Language Arts

Minor: History/Social Studies

Related Lesson Plans

Remarks/Notes

Trivia:

1. The word horse comes from the Anglo-Saxon word "hors" meaning swiftness.
2. The eyes of the horse are rather large and are set wide apart on the sides of the head. This gives the horse monocular vision or the ability to see separate objects with each eye at the same time.
3. Although the horse has a single compartment stomach like many animals, including man, the horse can utilize roughage (grass) like the cow which is a ruminant. This is possible because of a special type of structure called a cecum found on the intestine.

Suggested Activities:

1. Invite to class a Standardbred trainer or the owner of a local stable. Have your guest describe how his/her horses are trained and how they take care of the horses.
2. Write to the following organization:

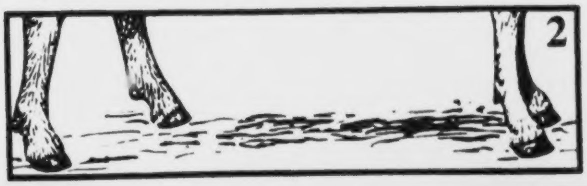
   United States Trotting Association
   750 Michigan Avenue
   Columbus, OH 43215
   (614) 224-2291

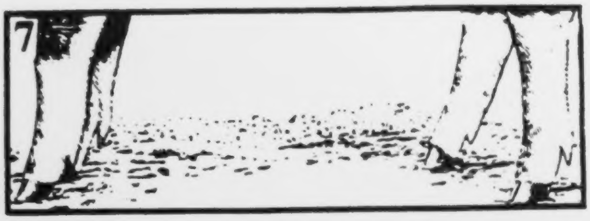
   Request information about the Standardbred horse. Students may work together to draft the letter. Emphasize the importance of the Standardbred horse in Ohio.
3. Have students write a short story about how the horse was used during the time the western frontier was settled. Encourage students to think about pulling covered wagons, transportation for the calvary and Indians, carrying the mail, pulling plows for farmers, etc. The students could then share their stories with the class.
4. Students draw a picture depicting a use of the horse.
5. Have students list all the famous horses they have seen on television or in the movies or in a book. Ex. Black Beauty, Mr. Ed, Trigger, Silver, etc.
6. Have students write a paragraph describing why some horses wear steel horse shoes.
7. Have students describe what makes one breed of horse different than another breed (color, size, disposition, etc.).
8. Worksheet — Farm Learning Tour #1 (page 7).
9. Worksheet — Farm Learning Tour #2 (page 8).

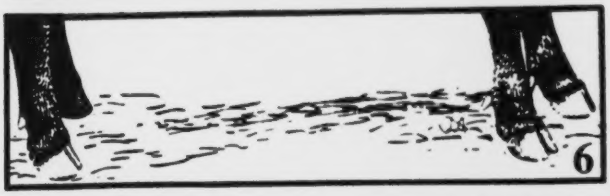
Name ______________________

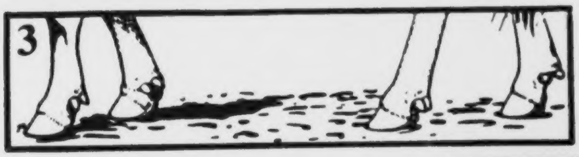
Farm Learning Tour #1

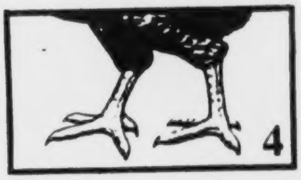
This is a "walking" tour of the farm. Each of these feet belong to a different farm animal. See if you can identify which animal goes with each set of feet. (See answers on page 10.)

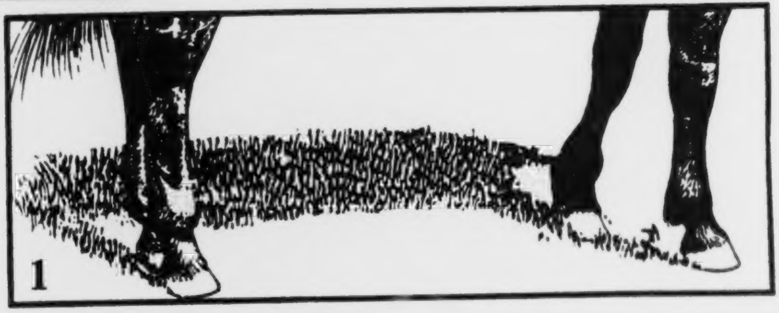












To help you, read the clues below:

1. Sometimes, I have to wear shoes. My hooves never stop growing, just like your fingernails.

   ____

2. I'm very good with my feet. I can climb rocky ledges and rough lands. Sometimes I wear a beard.

   ____

3. I have four stomachs and spend most of my day walking around and chewing on grass. If you treat me right, I can be "udderly" fantastic.

   ____

4. My feet help me scratch the ground for my food. They also help me sit.

   ____

5. I'm very gentle. My feet are about the only part of me that isn't covered with a wooly coat.

   ____

6. I'm a lot like a dairy cow. We're both cloven-hoofed. But I don't want to give you a bum steer. I don't produce milk.

   ____

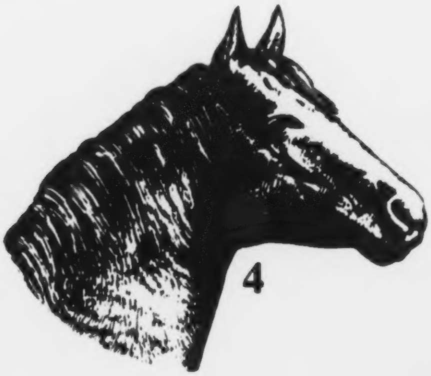
7. My feet aren't as cute as my tail, but they hold me up better. My feet are small for the rest of my body because I'm not as fat as you thought I was.

   ____

Name ______________________

Farm Learning Tour #2

Animals need to eat the right foods to grow big and strong and make food for us. Different farm animals eat different kinds of food. They also have different types of mouths — each designed to help them eat the foods they like and need. See if you can match each animal to the right clue. (See answers on page 10.)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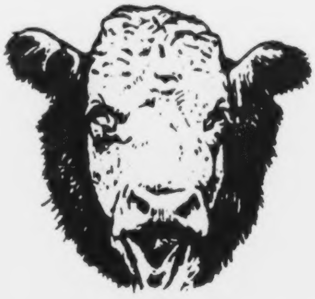
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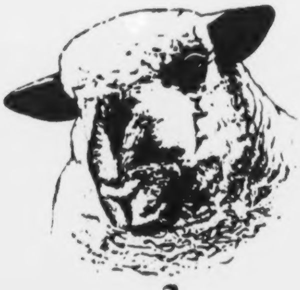
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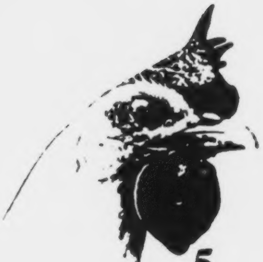
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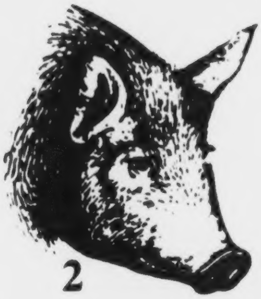

2

Clues

1. I have no upper teeth. I pull my food in with my lower teeth and swallow it whole. Later on, I bring it back up to chew it. When I chew, my jaw moves from side to side.

____

2. I was born with very sharp pointed teeth. The farmer trimmed my teeth when I was little so that I wouldn't bite myself or someone else. If I get the chance, I like to ''root'' in the ground to find my food.

____

3. I can give milk, but I'm not a cow. I like to eat grass, but I'm not a goat. I chew my food like both of these animals. Sometimes I'm all wooly and sometimes I'm shaved. I always eat facing the wind and like to eat with others like me.

____

4. My teeth never stop growing. When I'm grown, my teeth are very big and you can tell how old I am by looking at them. I like to eat hay and carrots and sugar.

____

5. My mouth is different from other animals. I like to pick up my food and swallow it whole. It goes into my gizzard. The farmer trims off the end of my mouth so that I don't stab others like me.

____

Name ____________________

Horses — What Have You Learned?

1. Match the following terms.

______ 1. foal		a. a male foal
______ 2. mare		b. a mature male horse
______ 3. colt		c. a horse used for heavy work
______ 4. filly		d. a mature female horse
______ 5. stallion		e. a castrated male horse
______ 6. gelding		f. colt or filly less than 1 year old
______ 7. draft		g. a female foal up to 3 years old

2. List four uses of the horse today.

a. ____

b. ____

c. ____

d. ____

3. You are asked by a neighbor to feed a horse. What will you feed it?

____

____

____

4. Describe what a horse mane and tail are used for?

____

____

____

5. Why do farmers use tractors to farm today instead of horses?

____

____

____

Farm Learning Tour #1 Key

1. Horse
2. Goat
3. Dairy cow
4. Chicken
5. Sheep
6. Beef steer
7. Pig

Farm Learning Tour #2 — Key

1. Beef animal
2. Pig
3. Sheep
4. Horse
5. Chicken

Horse Key — What Have You Learned?

1. 1. f
   2. d
   3. a
   4. g
   5. b
   6. e
   7. c
2. Heavy pulling, racing, rodeos, pleasure riding, harness racing, roping and branding, jumping, pulling carriages, police in large cities, circus, polo, and in parades.
3. Hay (high protein), oats, corn. Or a prepared mixed feed from a feed supplier.
   Horses also need plenty of water.
4. Horses use their mane and tail to protect themselves against flies. The tail swishes them away. Man uses the mane to hang onto when riding bareback.
5. Tractors are much faster in getting the farm work done. Farming with horses is not as efficient. Labor and time to produce a crop would go up, therefore increasing food costs in the grocery store.

Animals
Unit 26

Swine Production

Background – Pigs

Throughout our state and nation, pigs have played an important part in history. Even in ancient China, a year was named The Year of the Pig. Still today, the Year of the Pig is in the Chinese calendar once every twelve years,

Swine were first brought to North America by Hernando DeSoto in 1539. The early settlers in this nation have had pigs to use from this early time.

During the War of 1812, Sam Wilson, a New York pork packer, provided the Army troops with salt pork to eat. The pork for the troops was stamped with U.S. It was said that Uncle Sam was feeding the troops. The phrase, Uncle Sam, is still a symbol of our government today.

Have you ever heard of Wall Street? Today, this is the center of the New York Stock Exchange. It was named Wall Street because a wall was built to keep out roving swine herds.

The Ohio River area is rich in "hog history." Some of our pork sayings originated along its banks.

Have you ever heard of "Bringing home the bacon"? Steamboat captains on the Ohio River had to spend many days on the river at a time. There was no means of refrigeration or cold storage on the boats, so all the meat had to be smoked or cured. Bacon became the favorite meat of the riverboat captains. When the captains returned from home with their pay, they brought with them any bacon left from the trip. This was the beginning of the phrase "bringing home the bacon" indicating when someone has just been paid.

In the early days of Cincinnati, people ran their hogs through the city streets to get them to market. On their way to market, the farmers would stop along the Ohio River banks to wash their hogs. The water from this was called **hog wash**. You may have heard, or even used the saying, "hog wash" which means a story or fact that is "muddied up."

Cincinnati, Ohio, wasn't always called Cincinnati. For many years it was known as Porkopolis since it was the center of the pork packing industry of the United States during the days of the steamboat era. Kahns and Partridge Meats still have their headquarters in this Ohio City. In 1988 a pair of "flying pigs" was erected in a river bank park to honor Cincinnati's fame as Porkopolis.

Swine is a broad term for hogs. **Pork** is the food that comes from hogs. The terms **pig** and **piglets** are used for baby hogs. A **sow** is a female hog which has given birth. A **gilt** is a female hog under 1 year of age that has had no offspring. A **boar** is a male pig or hog. A **barrow** is a male hog which has been castrated before reaching breeding age. A barrow pig reaches butchering age sooner than a boar. A feeder pig is called a **shoat**.

A **breed** is a group of hogs that look alike and have the same **genetic** origin. The popular breeds of swine in the United States are Hampshire, Duroc, and Yorkshire. Landrace, Spotted, Poland, China, Chester White, and Berkshire are also raised. Crossbreeds are very popular for butchering.

One of the eight major breeds of hogs was developed in Ohio. A religious group, called the Shakers, brought Big China hogs with them from Philadelphia in 1816. The Shakers settled in Warren and Butler counties. Over the next several years the Shakers crossed the Big China hog with other popular breeds until a large, smooth hog was developed. Today that hog breed is called Poland China and is raised throughout our country.

"Fat as a pig" is an expression we still hear, but it's no longer true. Today, hogs have been bred for lean cuts of meat. In the early years the lard-type pig was important because lard was used for cooking. However, today cooks used vegetable oils in cooking, not lard from hogs. The pork producers have turned their attention to production of meat-type hogs.

Myths about pigs are that they are stupid and dirty - not true at all. Actually pigs are quite smart. In terms of animal I.Q., pigs are more intelligent than horses, cows, or even elephants. Also, they are actually very clean animals. The reason hogs wallow in wet mud in hot weather is that they cannot sweat, and the wet mud helps them lower their body temperature. A pig will choose cool water over mud anytime it has a chance. Hogs are mammals and have hair though it is scarce and bristly.

From 2 to 2.5 litters of pigs are born each year. A litter averages 8 to 10 pigs, with 12 to 14 not uncommon. The mother might average 300 pounds and the father 400 pounds. Time from breeding to farrowing, called the **gestation** period, averages 114 days in swine. A baby piglet will average 2.5 to 3.5 pounds at birth.

Many farmers have special buildings for the birth (**farrowing**) of baby pigs. The farrowing house allows the sow and her litter to stay comfortable. The sow farrows in a long, narrow stall called a **farrowing crate**. This crate prevents the sow from accidentally lying on her pigs, and allows the sow free movement. Baby pigs are given shots to help them stay healthy.

Farmers ear-notch pigs so they can tell one pig from another. Also, the tails are often clipped so the pigs don't chew on them for something to do. Pigs have very sharp teeth which must be removed to prevent them from biting themselves, their mother, or each other. Male pigs are usually **castrated** (testicles removed) between 2 and 4 weeks of age. Pigs are weaned from their mothers at about 4 weeks of age. The pigs will weigh an average of 40 pounds at 6 to 8 weeks of age. Pigs grow very fast at this stage of their development.

The pig has only one stomach as opposed to the four stomach compartments found in **ruminants** (cows, deer, goats, or sheep). They also cannot digest as much roughage as ruminants. Complete hog rations of a mixture of protein, vitamins, and minerals in addition to grain ration (commonly corn) must be provided. A hog will weigh approximately 220 pounds at about 6 months of age.

With today's lean meat-type hog, everything goes to market except the squeal. In addition to all the different cuts of meat produced on a hog, many important by-products come from this animal. Human heart valve replacements, insulin, paint brushes, and leather are just some of the by-products sold.

Lesson: **Swine Production**

Resources:

1. Grocery store newspaper ads.
2. Construction paper, scissors, glue and magic markers

Premise:

About ½ of the meat eaten in the United States is pork. Pork is sold as fresh (pork chops, pork steak) or cured pork (ham, bacon, smoked sausage).

Objectives:

1. Students will become aware of the importance of swine (livestock) production.

Specific things to look for:

a. How pigs are grown
b. Pig feed and care
c. Processing and marketing (retail)
d. Consumption
e. Byproducts
f. Math problems

Motivation:

We shall find just how pigs are important to us (medicines, food, leather).

How much do the students know?

1. Do you eat pork? Do you like bacon, sausage, ham? If so, you like and eat pork.
2. How big do pigs get? (usually 240 pounds; some old hogs can weigh 1,000 pounds).
3. Why do you think a pig might make a good pet?

Vocabulary:

1. instinct — inborn tendency
2. ruminant — animal with 4 stomach compartments
3. genetic — heredity, origin, beginnings
4. cross breeding — mating of 2 breeds
5. gilt — young female pig
6. barrow — young castrated male pig
7. farrowing — birthing

Trivia:

1. China was the earliest known civilization to domesticate the pig.
2. Pigs do not sweat. They dissipate heat by panting and lying in cool water.
3. In ancient Egypt pigs were used for treading seed into the ground. Their small hooves planted the seeds at the right depth in the soft soil.
4. Polynesians, making use of the pig's sensitive nose, employed them to search out lost burials.
5. Footballs used to be called "pigskin" because the ball covering was made from a hog's hide. Although no longer used to make footballs, the hide is made into all kinds of leather products.

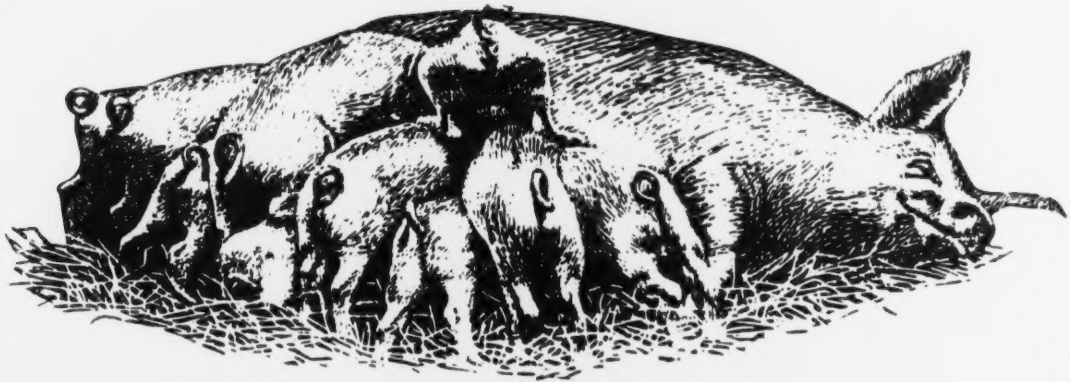
Ag Unit: **Food and Fiber**
Core
Major: **History/Social Studies**
Minor: **Mathematics**

Related Lesson Plans

Remarks/Notes

Suggested Activities:

1. Have students identify pork products (teacher may add additional ones): ham, pork chops, sausage, bacon, Canadian bacon, pork roast, barbecue, hog jowls, pig's feet, chitterings (chitlins). Students probably are not aware of by-products from swine; gelatin, pepsin in chewing gum, clothing, such as gloves and billfolds. Some medicines also come from swine.
2. Ask students: Why is a football called a "Pigskin"? (Because the cover used to be made from pig skin.)
3. Pretend you are an Ohio grocer. Feature pork as the "Week's Special." Create a poster to persuade shoppers to buy these pork products: pork chops, sausage, hams, spareribs, roasts, and ground pork.
4. "Hog is man's best friend." Defend this statement and write of the value of hogs in our lives.
5. Pig Grows Up (page 5). A worksheet designed to reinforce swine production facts.
6. Math worksheets: "Hog Wild Math" and "Pig Facts"



Name ______________________

A PIG GROWS UP

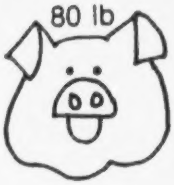
A pig is weaned (begins to eat other than from its mother) at approximately 4 to 7 weeks. After it is weaned, it is called a feeder pig.

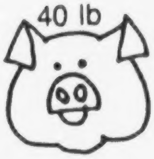
A pig eats ground corn, protein and mineral supplements. A farmer must be sure the pigs have water available at all times.

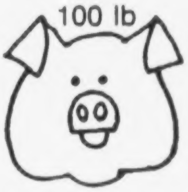
To reach a market weight of 230 pounds takes about 6 months.

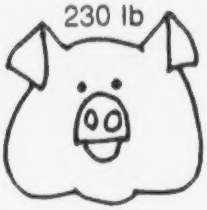
DIRECTIONS:

Find and draw a circle around the pig that is just the right weight for market.

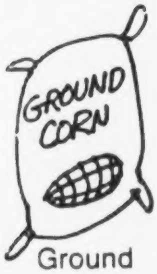

80 lb


40 lb


100 lb


230 lb

Circle the items the pig must have in its diet to make it the right market weight.

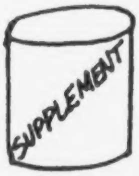


Ground corn

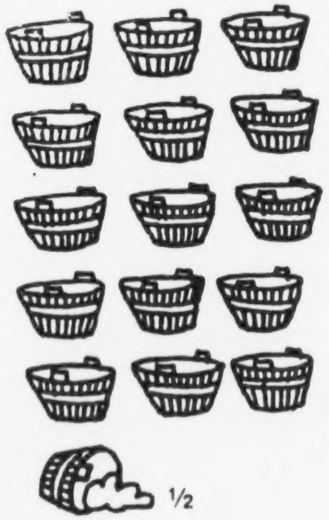
Wheat

Ice cream

Grass



Protein and mineral supplements



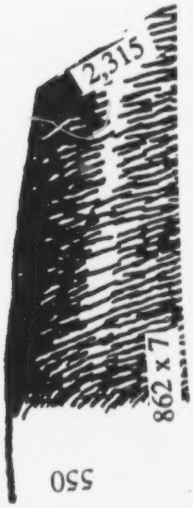
To reach market weight the pig must eat how many bushels of feed? COUNT THEM. ______________

This equals approximately 870 pounds of feed — 750 pounds of corn and how many pounds of protein and mineral supplements? ______________________
(Subtract the two figures to find that answer.)

To reach a market weight of 230 pounds takes about how many months? ______________________
(Find the answer on this page.)

Worksheet – Hog Wild Math

Procedure - Complete each of the multiplication problems on another piece of paper. Then cut the "pig pieces" and match the problems with the correct answers. Glue the puzzle together on your own paper.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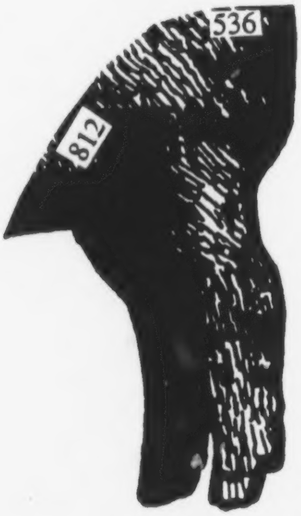
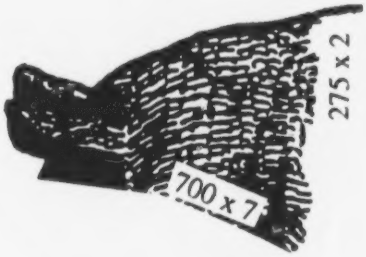
550

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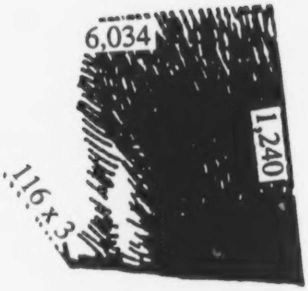
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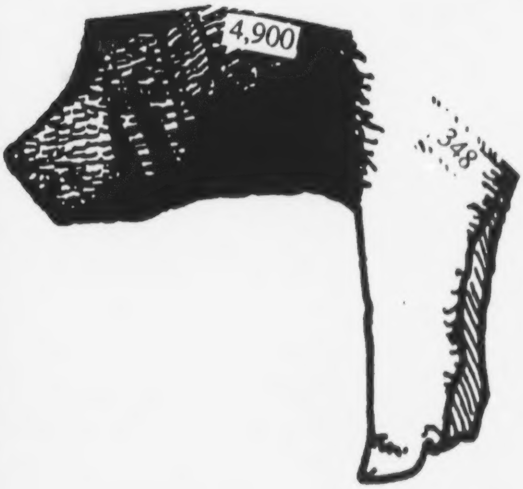

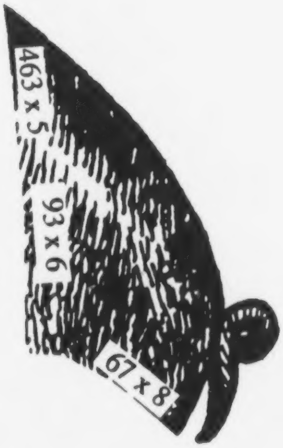
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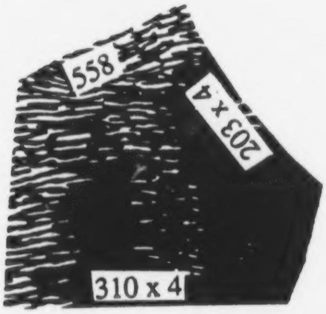
93 x 6
67 x 8


558
203 x 4
310 x 4

Name ______________________ **Unit: Swine Production**

Worksheet – Pig Facts

(Multiplication)

Please show your work:

1. A mother hog (called a sow) can have many piglets each time she gives birth. This is called a litter. If she has 11 piglets in each litter, how many piglets will she have if she has two litters?

__________ piglets

2. This sow has two litters every year. How many piglets can she have in two years?

__________ piglets

3. How many piglets can she have in five years?

__________ piglets

4. If she has 12 piglets in every litter, how many piglets can she have in five years?

__________ piglets

5. How many more piglets is this than if she has 11 piglets in every litter?

__________ piglets

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7

Name ______________________

Worksheet: Let's Go to Market

(Addition, Subtraction, Division)

Eddy and Linda Johnsen are taking their animals to market. Eddy has pigs in his truck. Linda has steers in her truck. The animals are healthy. They have not had any medicine for a long time. As they pull into the parking lot of the stockyards, where they will sell their animals, they drive their trucks over a scale.

Steers

For Linda's truck, the scale reads:	19,420 pounds
The truck and Linda together weigh:	11,000 pounds

1. How much do the animals weigh? _______ pounds
2. If there are five steers, what is their average weight? _______ pounds

Please show your work.

Pigs

For Eddy's truck, the scale reads:	19,420 pounds
The truck weighs	12,340 pounds
Eddy weighs	180 pounds

3. How much do the animals weigh? _______ pounds
4. If there are 30 pigs, what is their average weight? _______ pounds

Please show your work.

Adapted from "Agriculture In Iowa," Iowa

Name ____________________

Swine — What Have You Learned?

1. How do pigs keep cool in the summer?

2. How many litters are born each year?

3. In what way is a piglet in danger even when very near its mother?

4. Why must the farmer remove a baby pig's teeth?

5. How many stomachs does a pig have?

6. If a piglet weighs 3 pounds at birth and 230 pounds at market time, in 6 months how much has it gained?

7. Name two byproducts of the pig.

8. Define the following:

    pork —
    sow —
    farrowing —
    lard —
    barrow —
    trichinosis —

Worksheet Key – Pig Facts

1. 22 piglets
2. 44 piglets
3. 110 piglets
4. 120 piglets
5. 10 piglets

Worksheet Key – Let's Go to Market

1. 8,420 lb
2. 1,684 lb each
3. 6,300 lb
4. 230 lb each

Swine Key – What Have You Learned?

1. By panting and lying in cool water
2. two
3. The mother might lie down on the piglet and crush it
4. So it cannot injure the mother, itself, or other piglets
5. one
6. 227 pounds
7. Valves in human heart surgery, insulin for diabetics, etc.
8. pork – pig meat
   sow – mother pig
   farrowing – birthing
   barrow – a castrated male hog

Animals
Unit 27

Poultry Production

Background – Poultry

Poultry production includes the **laying flock**, meat chickens, turkeys, and waterfowl. Waterfowl farms specialize in ducks and geese. The laying flocks are typically small birds that lay white eggs. A good laying bird, under good management conditions, should lay 19 to 20 dozen (228 to 240) eggs during a 12- to 14-month laying cycle. The meat chickens (**broilers**) are young chickens (8 to 9 weeks) that weigh 3.5 pounds when processed.

Turkeys are raised for meat. The small breeds of turkeys will reach 12 to 19 pounds in 15 to 16 weeks, and the larger breeds will weigh 17 to 30 pounds in 26 to 28 weeks. The lower weights are for the Hen turkeys and the larger for Tom turkeys.

Once the male (rooster/chicken, tom/turkey, drake/duck, or gander/goose) mates with the female (hens), it takes a varying length of time for the eggs which are laid by the hen to incubate. In nature, a hen would lay a clutch about 15 eggs and then sit on them until they hatched (see the Chick Embryo's Growth, page 6).

Common Name	Incubation Period (in days)
Goose	28-32
Duck	28
Turkey	28
Chicken	21

The best temperature for good hatchability is from 98.6° to 100.4°F with a relative humidity of 75 to 80 precent.

Before hatching, the chick draws the yolk of the egg through the navel. This provides food until the chick fluffs up and dries. The chick will grow on this **absorbed** food for 24 to 48 hours after hatching.

Baby chicks must have a warm environment to exercise and sleep, and a cooler area to eat and drink. Chicks need food and water after removal from the incubator. First food will consist of a mash chick starter. They require ample fresh water.

Birds like all vertebrates, have a skeleton, a backbone, and two pairs of limbs (legs and wings). The most distinguishing feature is their feathers. The **down feathers** help keep the bird warm. **Body feathers** follow the shape of the bird's body. The large feathers in the wing and tail are called **flight feathers**.

The bird's bill and feet are good indicators of how a bird gets its food. Different beaks are used for cracking, chopping, scooping, stabbing, straining, and tearing. An adult chicken eats barley, wheat, and corn. The diet must be supplemented with fish meal or soybean meal in order to supply needed protein for growth or egg production. Calcium and phosphorus play a major role in forming strong skeletons and hard egg shells.

Poultry is a popular food in America. Turkeys are eaten all during the year but are especially enjoyed on special holidays like Thanksgiving and Christmas. We enjoy chicken and eggs in a wide variety of recipes.

In Ohio, the Indians hunted what we now call **game birds**. Some of these (e.g., turkeys) were domesticated and raised as part of our poultry production. From the early pioneer days until the mid 1900's almost every farm had a small flock of chickens that were used to provide eggs and meat for the farm family. The surplus was often taken to town for some spending money. Today there are very few small farm chicken flocks remaining. It is now usually cheaper and easier for farmers to buy their eggs and poultry rather than raise these items.

The early chicken flocks were usually the heavy New England breeds that laid brown eggs and produced a good-sized fryer for Sunday dinner. Most eggs marketed today in supermarkets are white-shelled eggs laid by the smaller Leghorn varieties. The broiler industry uses the Cornish hybrids.

Lesson: **Poultry Production**

Ag Unit: **Food and Fiber Core**
Major: **Science**
Minor: **Mathematics**
Language Arts

Related Lesson Plans

The Start of Life – Life Cycle

Remarks/Notes

Resources:

Worksheet, feathers, glue, paper, incubator, fertilized eggs.

Premise:

The hatching of chicken eggs is an event that is exciting for all ages. A small number of chicks can be easily studied to learn the growth, development and nutrition of an organism.

Objectives:

Students will learn information about poultry production and the preparation/nutritional value of poultry.

Specifics to look for:

1. Different kinds of chickens.
2. How meat chickens and laying chickens differ.
3. Proper method of hatching chickens.
4. What keeps a baby chicken, duck, goose or turkey alive the first day or two?
5. What two nutrients make strong egg shells?

Motivation:

1. In this modern world people are so interested in cholesterol that they are eating more chicken than ever.

How much do the students know?

1. How are frying chickens different from laying hens?
2. Do you know the two main reasons for raising chickens are (1) for the eggs and (2) for the meat?
3. Can you think of any uses for feathers?

Vocabulary:

1. Laying — giving us eggs; to produce an egg
2. Flock — group of hens
3. Incubation — time for development of egg embryo
4. Embryo — living seed, beginning
5. Species — class of living things with like characteristics
6. Absorbed — taken up
7. Down — soft, furry feathers next to body
8. Body feathers — follow body shape
9. Flight feathers — used in flying
10. Poultry — generic term for domesticated birds

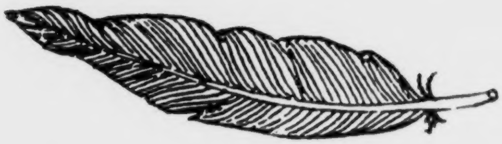
Trivia:

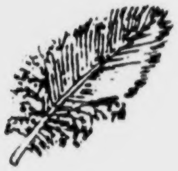
1. When eggs are $0.90 per dozen, the cost per pound is $0.60.
2. Shell color has never been shown to relate to quality or nutritional value of the egg.
3. There are more chickens in the world than people.
4. Baby chickens use an egg tooth to break out of the shell.
5. In 1943, a slogan in F.D. Roosevelt's presidential campaign promised "a chicken in every pot." In 1943, chicken was definitely a luxury.

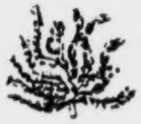
Suggested Activities:

1. Worksheet – Fowl Facts – multiplication with decimals and whole numbers
2. Worksheet – Poultry Puzzles. Use whole numbers up to 100,000,multiplication with decimals and whole numbers and division using whole numbers.
3. Collect a large assortment of feathers. These may be from a zoo, poultry farm or pet shop. Be sure the collection contains examples of down, body, and flight feathers. Distribute packets of feathers to groups of 3 or 4 students. Ask them to categorize (sort) them by type: down, body, and flight. Discuss the grouping. Speculate as to what kind of birds the various feathers come from and the part of the bird the feathers come from.
4. Have students make a picture on a piece of paper out of the feathers.
5. Invite a local poultry producer to visit the class.
6. Incubate eggs in the classroom (see Unit 12 – The Start of Life - Life Cycle). Break open any eggs that do not hatch to see if you can determine when the embryos died. If there is no evidence of an embryo, can you give reasons for this condition?
7. The A*MAZE*ING EGG: from Hen to Home (page 5).
8. Have students write one or more short stories. The stories could be about the following:
    a. Being called a chicken
    b. The importance of chicken or poultry
    c. A newly hatched chick

    Have students tell why they would or would not like to be the person or chicken in their story.
9. Make an egg candling device. Cut a hole in the top of a shoe box. Make the hole slightly smaller than an egg. Cut a hole in the opposite side of the box and insert a small light bulb. When an egg is placed over the small hole, you can observe some of the contents of the eggs. Observe the changes in an embryo as the eggs develop.



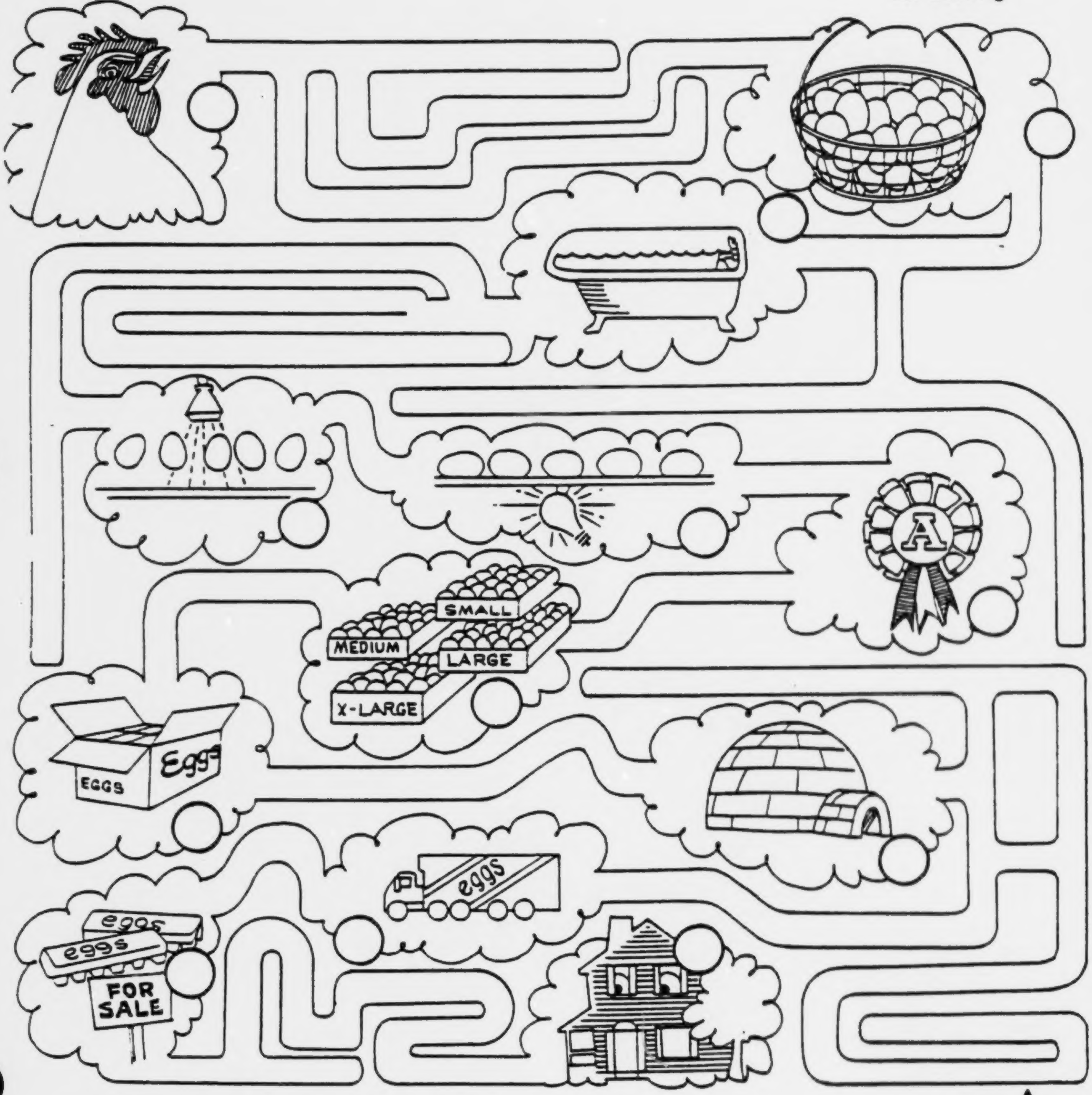




The A*MAZE*ING EGG: from Hen to Home

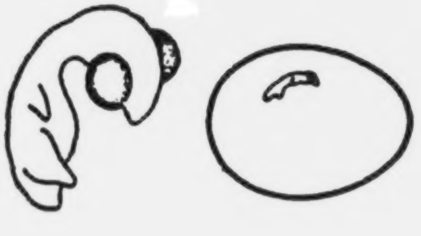
Below are the steps that an egg follows on the journey from the hen to the home. Number the pictures to show the same order. Then trace the steps through the maze until the eggs reach your refrigerator. Don't get lost along the way!

1. Laying
2. Collecting
3. Washing
4. Treating
5. Candling
6. Grading
7. Sorting
8. Packing
9. Cooling
10. Shipping
11. Selling
12. Storing

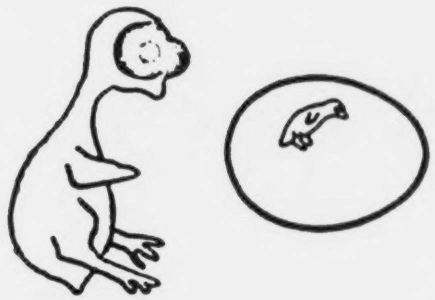

SMALL
MEDIUM
LARGE
X-LARGE
Eggs
EGGS
eggs
eggs
eggs
FOR SALE

Reprinted with permission from the American Egg Board.

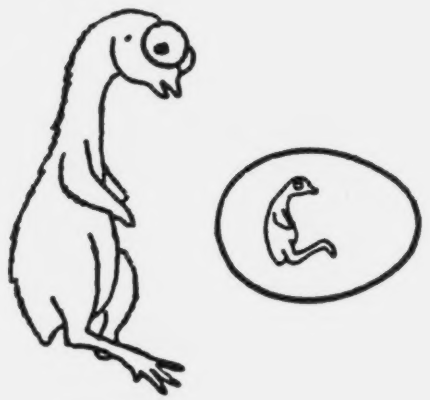
The Chick Embryo's Growth



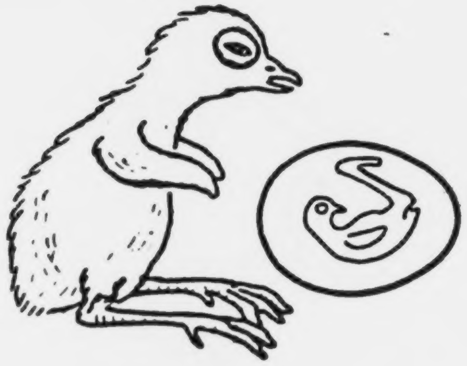
6th Day



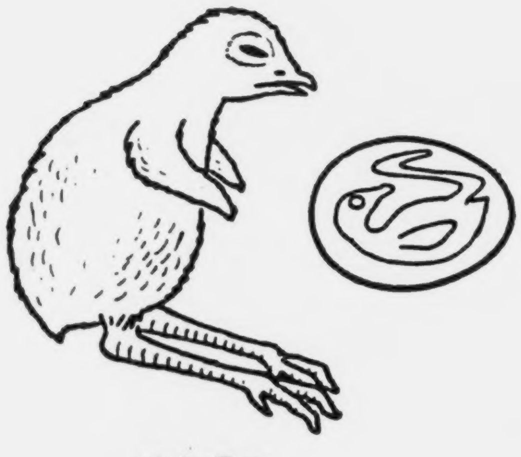
9th Day



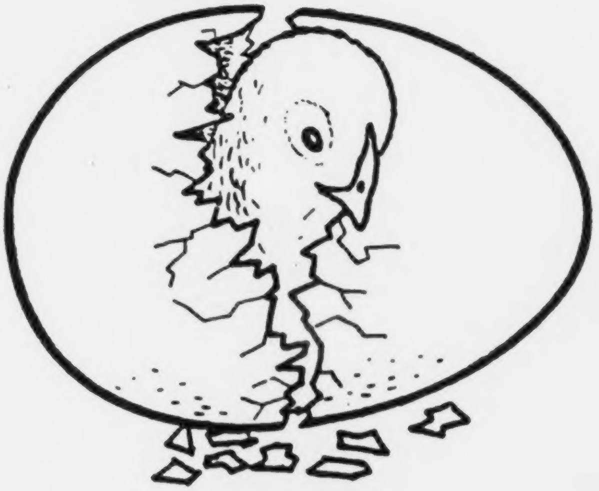
12th Day



15th Day



18th Day



21st Day

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Unit: Poultry Production

Name ______________________________________

Worksheet – Fowl Facts

(Multiplication/Decimals)

Most of the chickens eaten today are broilers. Broilers are young chickens, usually under 13 weeks of age and usually weighing about 3.5 pounds. They may also be called fryers.

Chicks grow very fast and convert feed to meat very efficiently. Today, for each pound the broiler weighs, it must eat 2 pounds of chicken feed during its life.

1. How much chicken feed does a broiler have to eat to reach a weight of 3.5 pounds?

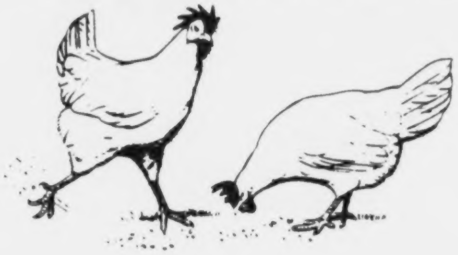
   __________ pounds

2. Chickens grow faster today than they used to because of scientific advances in food for chickens. In 1940, a chicken had to eat about 4 pounds of feed for each pound of body weight. How much chicken feed would a 3.5 pound broiler have to eat in 1940?

   __________ pounds

3. How much more feed did a chicken have to eat in 1940 than today to reach a weight of 3.5 pounds?

   __________ pounds



4. If chicken feed costs 80 cents per pound today, what were the feed costs for a 3.5 pound broiler?

   __________ pounds

5. If chicken feed cost 2 cents per pound in 1940, what were the feed costs for a 3.5 pound broiler?

   __________ pounds

6. If humans only had to eat a total of 2 pounds of food for each pound of body weight, how much food would an 85 pound fourth grader have eaten in his/her life?

   __________ pounds

7. The average person eats 58 pounds of chicken each year. How many pounds of chicken would a 9-year-old have eaten in his/her life at that rate?

   __________ pounds

8. You can see that people have to eat a lot more food for each pound of body weight than chickens. Chickens grow so fast that at 6½ weeks of age, broilers weigh 43.7 times their original hatching weight. If humans grew at that rate, how much would an 8 pound newborn weigh at 6½ weeks of age?

   __________ pounds

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7

Name ____________________________

Unit: Poultry Production

Worksheet – Poultry Puzzles

(Multiplication/Division)

1. Most chicken farmers raise large numbers of chickens in long buildings. They may raise 100,000 chickens at a time in buildings as long as a football field. A football field is 100 yards long. How long is that in feet? (clue: 3 feet = 1 yard)

   __________ feet

   Often the farmer who raises chicks does not own them. They belong to a big company that signs a contract with many farmers to raise their chicks until they reach market size. The company that owns the chicks may be a feed company. The farmer raises the chicks from a few days old to about 6½ weeks.

2. The large company pays the farmer a few cents per pound of chicken produced. For example, a farmer may receive 4 cents per pound for a 4 pound chicken. How much would the farmer receive for that chicken?

   ____

3. It is easy to see why the farmer must raise a lot of chickens! How much would the farmer be paid for 100,000 chickens like the one in problem #2? (Watch out for decimal point!)

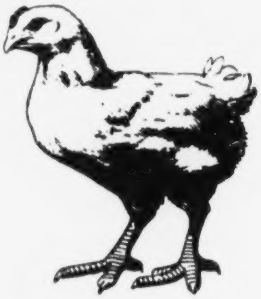
   ____

4. The farmer raises each group of chickens about 6½ weeks, then the poultry house sits empty about 2 weeks before the next group of chicks arrives. The farmer sterilizes the house before the next group of chicks arrives. There are 52 weeks in a year. How many groups of chicks would this farmer raise in one year?

   ____

5. If the farmer raises 100,000 chickens in each group, how many chickens will he raise in a year? (Use your answer to #4 to answer this question.)

   ____



Farmers have a lot of expenses to pay. They have to pay for buildings, equipment, fuel, repairs and other things. Income is the amount of money paid to the farmers for their product. Profit is the amount of money the farmer has left after paying for expenses.

6. How much income would be produced in one year if the farmer is paid $10,000 for each of 5 groups of chickens?

   ____

7. If the farmer in problem #6 has expenses of $35,000 per year, how much would profit be for the year?

   ____

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Name ______________________

Poultry — What Have You Learned?

Select the letter of the word on the right which most closely relates to the word on the left. Place letter on the line provided in front of the word on the left.

_______ 1. poult

_______ 2. incubator

_______ 3. broody bird

_______ 4. beak

_______ 5. drake

_______ 6. humidity

_______ 7. chick

_______ 8. tom

_______ 9. yolk

_______ 10. down

_______ 11. dozen

_______ 12. gosling

_______ 13. gander

_______ 14. white

A. male goose

B. twelve

C. soft furry covering

D. baby chicken

E. bill, hard mouth

F. male turkey

G. place for hatching eggs

H. moisture in air

I. male duck

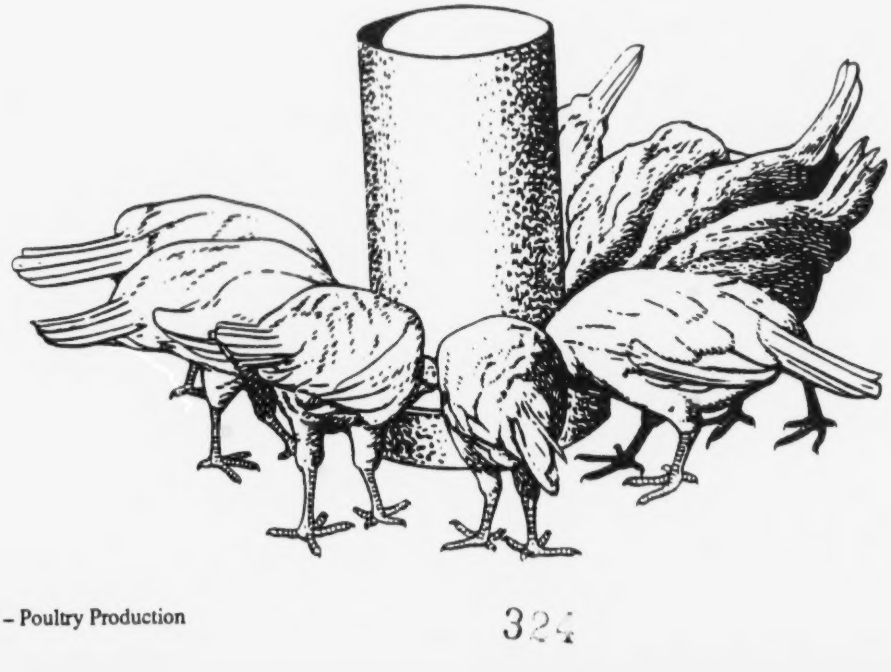
J. a clucking mother hen

K. colorless part of the egg

L. baby goose

M. yellow part of the egg

N. baby turkey



Worksheet Key – Fowl Facts

1. 7.0 pounds
2. 14.0 pounds
3. 7.0 pounds
4. $5.60
5. 28 cents
6. 170 pounds
7. 522 pounds
8. 349.6 pounds

Worksheet Key – Poultry Puzzles

1. 300 feet
2. 16 cents
3. $16,000
4. 6.1
5. 610,00
6. $50,000
7. 15,000

Poultry Key – What Have You Learned?

1. N
2. G
3. J
4. E
5. I
6. H
7. D
8. F
9. M
10. C
11. B
12. L
13. A
14. K

Agriculture and Natural Resources

Unit	Title
28.	What Are Natural Resources?
29.	Air
30.	Water Conservation
31.	Weather and Agriculture
32.	Soils
33.	Soil Conservation
34.	Land Use Planning

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Agriculture and
Natural Resources
Unit 28

What Are Natural Resources?

Background – Natural Resources

Everyday we use natural resources. We keep our houses warm by burning coal, wood, or oil by using electric heaters that are powered by energy produced from natural resources.

Even while we're sleeping, we still need **air** to breathe. In the morning we need **water** to bathe. On the way to school, we might kick a rock down the sidewalk to pass the time. At school, we use sheets of paper that are made from wood. When we write about a bird's song we use a lead/graphite pencil. During hunting season we may feast upon some wild game. During the winter we might ski on the snow. In later summer we may gather wild blackberries. Or we may decide to try our luck fishing in a creek. Then there are those days when all we care to do is go fly a kite.

Let's consider the **renewable** and **non-renewable** resources that make Ohio so special. Ohio has a variety of terrain and geography. Hills, valleys, lakes, and rivers are found here. These factors allow for the diversity of **flora** and **fauna** in the state.

In southeastern Ohio are large forests that produce timber, **natural habitat** for wildlife, and mineral deposits for mining. Recreational activities, including camping and hunting, are important to Ohio citizens.

Our farmland has fertile soil and grows an abundance of **cultivated crops**. Our land also provides wild animals and livestock with water, food, and living space. Without these resources the wild animals would be classified as **endangered species** and might become **extinct**. Water, grasses, deer, and trees are **renewable resources**. With good management we will always have a supply of these resources. Oil, coal, and lime are **nonrenewable** resources. When these supplies are used up they are gone forever.

Soil formation is a continuous process. However, this process is so slow that any losses cannot be replaced in our lifetime.

The four seasons of the year affect the resources in Ohio. During the winter we get snow which furnishes extra water for the rest of the year. Our spring and summer months provide a long, warm growing season for grasses, bushes, and cultivated crops. Fall is a wonderful time to visit our parks and see the deciduous trees that are changing colors. Ohio's environment provides for the needs of its wildlife throughout the year.

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Lesson: **What Are Natural Resources?**

Ag Unit: **Natural Resources Core**

Major: **Science**

Minor: **Language Arts**

Related Lesson Plans

Soils

Soil Conservation

Water Conservation

Remarks/Notes

Resources:

Samples of rocks and minerals, a quart of oil, plant specimens, a jar of water, animal illustrations, a can of tuna, bird illustrations, an ear of corn, a wool blanket, a sheet of paper, a block of wood, a tub of soil, a plastic bag of air, cotton balls.

Premise:

Natural resources are important to our standard of living. They provide us with food, shelter, clothing and recreation. Some natural resources are renewable while others are not.

Objectives:

1. Students will learn to distinguish between natural resources and synthetic materials.
2. Students will gain an appreciation of natural resources.
3. Students will become aware of the need for preserving natural resources.

Vocabulary:

1. Non-renewable resource — something that cannot be replaced
2. Renewable resource — something that can be replaced
3. Extinct — When a plant or an animal group no longer exists on earth
4. Cultivated crop — a plant that a farmer grows and harvests
5. Natural habitat — the space or environment where an animal lives in the wild
6. Flora — a term used for the native plants of a certain region
7. Fauna — a term used for the native animals of a certain region
8. Synthetics — something manmade instead of occurring naturally
9. Endangered species — a species close to extinction

Trivia:

1. Each year thousands of acres of topsoil are robbed from the land by water and wind. In Ohio, erosion due to water is significantly higher than erosion from wind.
2. The United states was the first country to establish a national wilderness preservation system.
3. Rich soils and plentiful rainfall make for good growing conditions. Average annual precipitation varies from 30 inches in northern Ohio to 44 inches in southern Ohio. Growing season rainfall is 17 to 25 inches.

3

Suggested Activities:

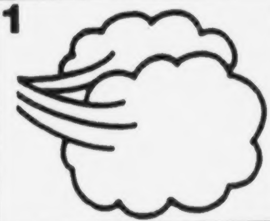
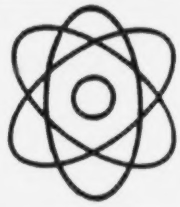
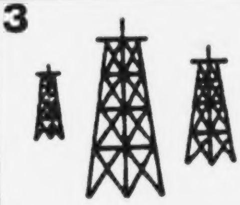
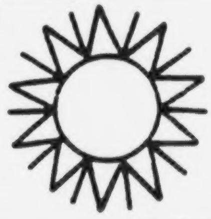
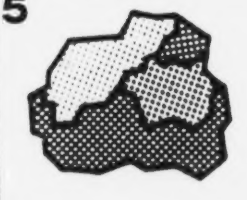
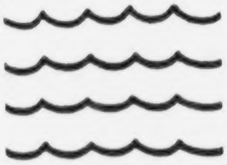
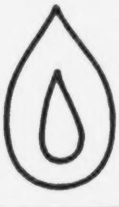
1. I'm Buzzy the Energy Bee! (page 5). Have students survey the items on display. Then on a sheet of paper have the students categorize them as to their use(s), origin and value. After the students have completed their lists, ask them to select five items to be classified as extinct or no longer available. Discuss with the class what the effects will be if these items were no longer available to them.
2. Read "Drawing Word Pictures" (pages 6 and 7). Allow students an opportunity to talk about scenes or experiences in nature which have been especially meaningful to them. If possible, go outdoors to an area where the students can observe and enjoy nature. Allow a quiet time for the students to close their eyes and pay attention to the way they are feeling. Return to the classroom and have the students write their own Haiku about nature. These should be shared either by reading them aloud or posted on the bulletin board.
3. Have students draw a picture which does not have any natural resources in it. Ask the students to display their drawings and have the class try to find hidden natural resources in the pictures.
4. Creative Writing Assignment: Creature from the Planet X. Imagine that you have just discovered a new planet. Using your instruments, you have identified 20 facts about the conditions of that planet. Now using those facts, write a story about the creature that lives on the planet. You need to explain how it looks, where it lives and what it eats. Describe how the creature would get from place to place on the new planet. You may draw a picture of the creature or cut out pictures from magazines and paste them together if you wish. Label your picture and explain why the creature has certain features in order to survive on the planet.

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

I'm Buzzy the Energy Bee!

I'm always busy, so people say I have lots of energy. I've been picked to tell you about a different kind of energy — the energy people use to heat their homes, run their cars and turn their machines.

Our world is full of energy. Each picture below shows a thing that makes energy. Under the pictures are some names. Can you match the pictures and the names? To help you get started I'll give the answer to one: #7 is natural gas.

1 	2 
3 	4 
5 	6 
7 	Sun Oil Water Wind Natural gas Atom Coal

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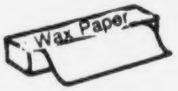
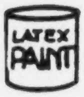
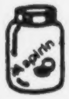
The energy sources people use the most are called fossil fuels. These fossil fuels are oil, coal and natural gas. They are found underground. People sometimes dig tunnels to reach the coal. They drill wells to find oil and natural gas.

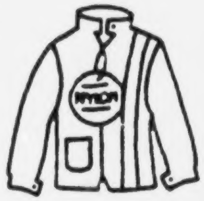
These fossil fuels are burned to make energy in the form of heat. Then some of the heat is used in making electricity for lighting our homes and running appliances like refrigerators. Much of the oil is made into gasoline for cars and trucks.

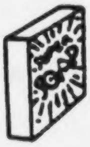
Oil is also used to make many things we use. I drew some of them here. Draw a circle around the ones you have in your home.

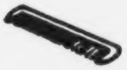












We have some problems

A problem with oil, coal and natural gas is that there is only so much of it in the earth, and someday hundreds of years from now, it will be used up. Because of this, scientists are looking for a kind of energy that cannot be used up.

Another problem with oil and coal is that they are sometimes dirty when they burn. People who drill for oil and dig for coal are looking for ways to make these natural resources clean. Scientists are also trying to find new kinds of energy that will be clean when used.

Look again at the pictures of things that make energy. Can you find three that will not be used up.

Drawing Word Pictures Using the Haiku Method

When we are close to nature, we often have special feelings that are hard to express. Poetry is one way to draw a word picture of special feelings.

Haiku is a beautiful Japanese form of poetry used to describe things in nature. Every haiku has three lines, which do not rhyme, and the haiku in Japan always has 17 syllables. A common form is five syllables in the first line, seven syllables in the second line and five syllables in the third line. But at this time, don't worry too much about having the right number of syllables. It is more important to think of words that draw a picture and express your feelings.

Read these haiku and let them draw a picture in your mind.

The soft, gentle breeze
  Makes music in the treetops;
    The harp of nature.

White, billowing clouds,
  Like cotton balls in the sky,
    Drift over my head.

Take a walk outside — in a park or in the woods. Look at the beauty of nature. Do you see the birds, squirrels or other small animals? Are there big, strong trees? Small, delicate plants? Flowers? Do you see clouds drifting across the sky? How does the air feel on your skin? Is there a slight breeze? Is the sun warm on your face? What can you smell? Does the air smell fresh and clean? Does it carry the sweetness of flowers? What is the smell of the earth after a rain? What colors do you see? The fresh green of young plants in spring, the golds and reds of autumn or a white blanket of snow in winter?

If you can't actually walk outdoors, you can close your eyes and imagine the sights, sounds and smells of nature. Imagine all the details of one of your favorite places and remember how it makes you feel.

Think of something special to put into your own, special word picture.

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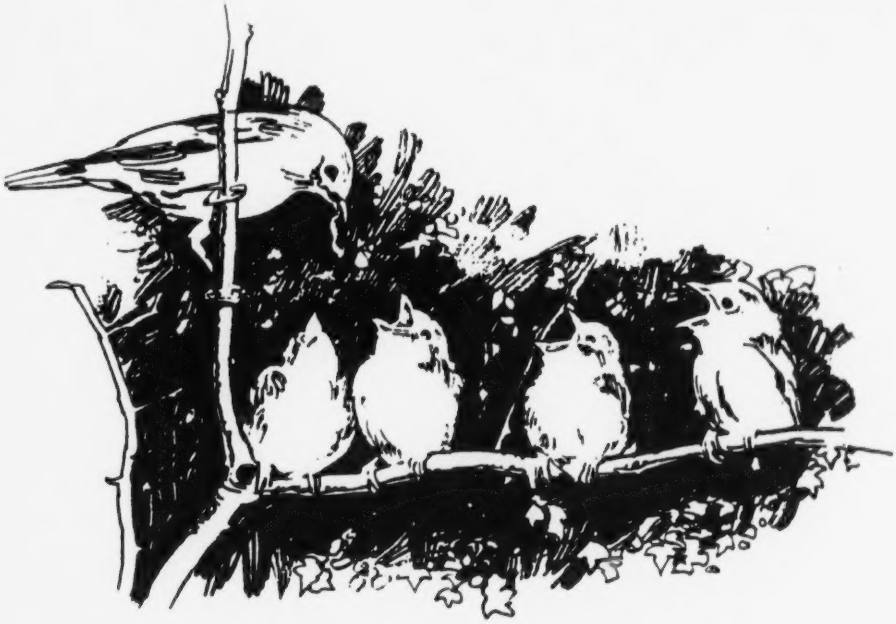
Name ______________________

What Are Natural Resources
— What Have You Learned?

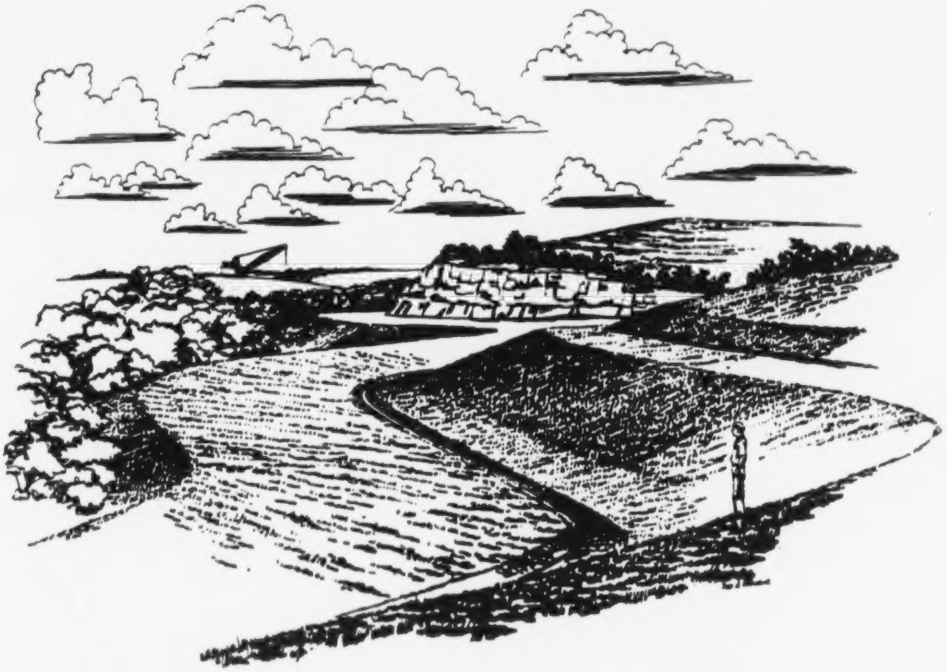
True-False (circle your choice)

T F 1. Wild animals need food, water, and living space.
T F 2. Soil is considered a renewable natural resource.
T F 3. Southeastern Ohio is best known for the fertile soils on which cultivated crops are grown.
T F 4. Fresh, clean water is necessary for animals to live.
T F 5. The four seasons are called winter, summer, fall, and spring.
T F 6. Ohio has mountains, deserts, valleys, lakes, and rivers.
T F 7. Wildlife in Ohio has become extinct because of the severe winters.
T F 8. Water is a renewable natural resource.
T F 9. The place where a wild animal lives is called its habitat.
T F 10. Oil is a non-renewable resource.



What Are Natural Resources Key
— What Have You Learned?

1. True
2. False
3. False
4. True
5. True
6. False
7. False
8. True
9. True
10. True



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Agriculture and
Natural Resources
Unit 29

Air

Background – Air

Air is composed of many **gases**. Some of these are nitrogen, **oxygen**, and **carbon dioxide**. Animals use oxygen for breathing and plants use carbon dioxide for their food production (photosynthesis). The nitrogen in the air is an important source of plant food. The burning of fuels such as gasoline in a car produces an **exhaust** which is made of carbon-containing compounds called hydrocarbons. The burning of wood produces smoke which also contains gases.

Air pollution is causing increased plant and animal losses each year. The combination of fog, smoke, exhaust fumes, and dust is called **smog**. The invisible chemical compounds such as sulfur dioxide, **ozone**, and nitrogen dioxide are the most injurious to plants. The smoke does add to the dust and other particles collecting in the atmosphere, however, causing some reduction in light intensity, which could have serious effects over a long period of time. The agricultural losses in the United States from air pollution are estimated to be over $500 million annually. The lack of oxygen makes it difficult for animals to breathe and act normally. The ozone gas is harmful to their lungs. The lack of carbon dioxide is detrimental to plants because they cannot produce enough food for themselves to live.

People and animals suffer lung diseases if the air pollution lasts for a long time. Plants cannot grow and will die if subjected to air pollution for too long a period of time.

Can you think of a way to reduce air pollution?

Lesson: **Air**

Ag Unit: **Natural Resources**

Core

Major: **Science**

Minor: **Health**

Related Lesson Plans

Weather and Agriculture

What Are Natural Resources?

Remarks/Notes

Resources:

Large ice chest, jumbo balloons, ice, tape measure, gallon jug, magic markers, rubber tubing, 2 cup measuring cup, sink or tub.

Premise:

Air is composed of various gases which are invisible. These gases will displace water. They will also require less volume when subjected to cold temperatures. Air can mix with water and pollutants and must move freely into and through the soil.

Objectives:

1. Students will be able to identify two facts about the nature of air.
2. Students will develop an understanding of the causes of air pollution.

Vocabulary:

1. Gas — the form of a substance in which it can expand indefinitely
2. Carbon dioxide — a gas made up of one carbon and two oxygen atoms
3. Respiration — a single complete act of breathing
4. Oxygen — a tasteless, odorless gas necessary for life that makes up about 18% of the atmosphere
5. Pollutant — material that degrades the quality of the air
6. Exhaust — waste gases produced from an internal combustion engine (auto, truck, plane, etc.)
7. Smog — a mixture of smoke, dust and fog in the atmosphere
8. Ozone — a pungent smelling form of oxygen in the atmosphere

Trivia:

1. Plants use carbon dioxide and produce oxygen in photosynthesis.
2. Plants will die if the ozone concentration is too heavy for an extended period of time.
3. The oxygen that plants produce benefits animals and the earth's atmosphere.
4. Air pollution is hazardous to livestock's health.

Suggested Activities:

1. Pair the students into teams. Have each team write their initials on a balloon and blow it up. Now have each team measure their balloon horizontally and vertically and record the measurements. When all the teams are ready, place the balloons in the ice chest for 30 to 40 minutes. Have the teams remeasure their balloons, record the measurements and speculate on why there was a difference.
2. Fill the gallon jug up with water using the 2 cup measuring cup and mark each water level with one of the colored markers. Insert the tubing and invert the jug carefully into the sink or tub. Note the water level and make sure to keep the tube above the level of the jug (otherwise the water will flow out). Have a student blow through the tube for as long as he/she can. Use the other colored magic marker to mark the new water level. Then have another student blow through the tube. Again mark the water level. Continue to do this until all the water is gone. Measure the distance between the water levels. (The 2-cup lines give volume relationship.) Ask the students what force pushed the water out of the jug and where it came from.
3. Have the students write a story about having to live in a plastic bubble with a plant as their oxygen supply or with an oxygen tank and explain what their life would be like. Have them list the activities they would not be able to do anymore. Maybe the students know someone who has asthma or other breathing problems which limit their activities and wish to discuss the effects air pollution causes them.
4. Plant a house plant in a medium size clay pot. Invert the bottom ¾ of a plastic liter beverage bottle over the plant. After a week water droplets should form on the walls of the bottle. Ask the students how the water got there?

5.. Use the "Smell Detective Game" (page 5). Supplies include:

An orange cut in half (keep in plastic bag until ready)
A stick of incense
Matches
Can of aerosol spray (Lysol)
Bucket

Ask four students to volunteer to participate in the activity. Place them in one of each of the classroom's corners. When the class is ready to begin, have the student with the orange take it out of the bag, light the incense and have the student with the can of baby powder shake it into the bucket. Instruct the student with the can of aerosol to spray it for approximately 30 seconds.

Have class members raise their hands when they can smell a scent. On their forms they can record which scent they smelled first, second, etc. Run the exercise for about 2 minutes.

Have the students discuss their results.

The Smell Detective Game

Smell maker:

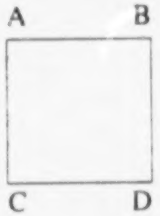
Orange
Baby powder
Incense
Aerosol spray (Lysol)

Student's name:	Can you smell it? (Circle yes or no)	
______________________	yes	no
______________________	yes	no
______________________	yes	no
______________________	yes	no

What Do You Think?

1. Are scents a type of air pollution? ______________________
2. How do scents travel? ______________________
3. If you can smell it, are you breathing it too? ______________________
4. What scents might cause your eyes to burn? ______________________

Mark where your desk is?



Air — What Have You Learned?

Conduct a contest on all the ways people can help to keep air clean. You may want the students to write an essay, or you may opt to have them submit the ideas and then write them on the board. The student with the most ideas would share the prize with the other class members because air belongs to everyone.

Agriculture and
Natural Resources
Unit 30

Water Conservation

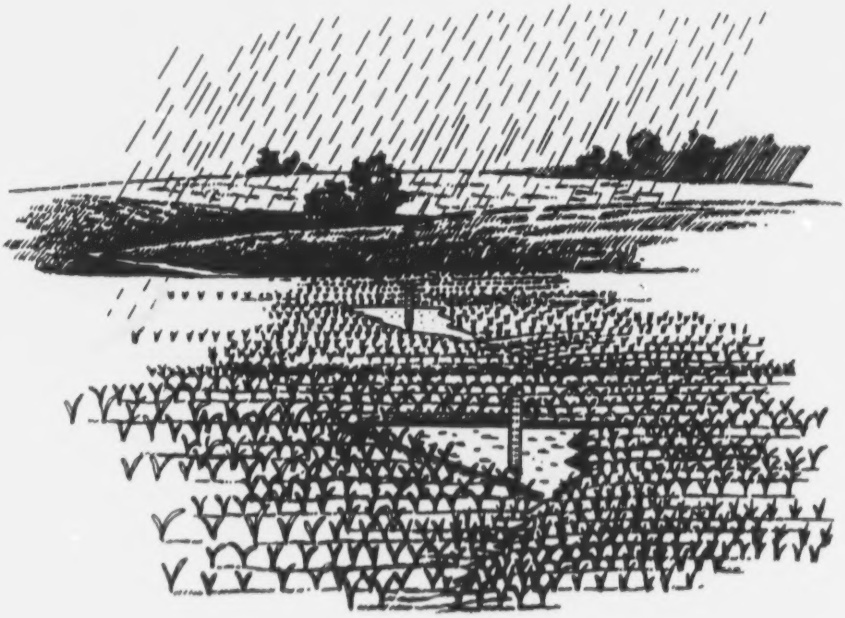
Background — Water Conservation

Water is a natural resource that directly benefits the quality of life in Ohio. The water cycle is easily understood if we make a few observations right around us. Our precipitation generally arrives from the west-southwest. The amount of precipitation directly affects the stream and river flows of Ohio. Two-thirds of our drainage is south to the Ohio River, and 1/3 flows north to Lake Erie.

The major components of the hydraulic cycle are **evaporation** of water molecules (H_2O gas) and **condensation** (H_2O liquid/solid). Utilizing a map we can plot the course of the clouds and illustrate the cycle of water molecules.

Water conservation is an attempt by people to use water to the greatest benefit to all those depend upon it. This includes humans, wildlife (plants and animals) and the environment. Human needs for water are not restricted just to drinking. Animal needs for water are also not restricted just to drinking or food. Water can form part of their habitat or meet future needs. Another factor which humans have a responsibility for is guarding against dire affects of a drought. So when we talk about water conservation, you can see that it is everyone's problem.

We are fortunate that water is a renewable resource and that it is available in good supply in Ohio; however, this does not preclude us from using it unwisely. The main source of drinking water in this state comes from wells which draw water up from aquifers. In other parts of the U.S., aquifers have gone dry and there is no direct method for replenishing the underground rivers that are depended upon by the farmers and people in the cities.



SOIL CONSERVATION SERVICE
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Lesson: **Water Conservation**

Resources:

4 – 2 × 8's, 2 pounds of sand, 2 pounds of gravel, 1 cinder block or large rock, 2 pounds soil.

Premise:

Nature has afforded us with insurance to prevent running out of water. We have annual precipitation in Idaho, good watersheds and large aquifers. If we utilize our water wisely, all those humans, plants and animals who depend upon it will enjoy a good life in Ohio.

Objectives:

1. The student will learn through observations how watersheds work.
2. The student will be able to illustrate the water cycle.
3. The student will demonstrate an appreciation for wise consumption of water.

Motivation:

How much do the students know?

Ask the students where their drinking water comes from.

Vocabulary:

1. Watershed — area drained by a river system found in the mountains
2. Runoff — water which is not absorbed into the soil
3. Precipitation — annual rain, sleet, hail or snow
4. Evaporation — the process of water molecules changing into a gaseous state and rising in the atmosphere
5. Aquifer — an underground river

Trivia:

1. An acre inch of water is 27,154 gallons of water. This will cover a one-acre area with one inch of water.
2. The average Ohioan uses approximately 160 gallons of fresh water per day. An additional 68 gallons is used for rural domestic and livestock use.
3. Ohio has more than 50,000 lakes, ponds, and reservoirs. These areas cover 200,000 acres.
4. The combined length of Ohio streams is 44,000 miles – nearly one mile of stream for each square mile of surface area in the state.

Ag Unit: **Natural Resources**

Core

Major: **Science**

Minor: **Language arts**
Mathematics

Related Lesson Plans

Soil

Soil Conservation

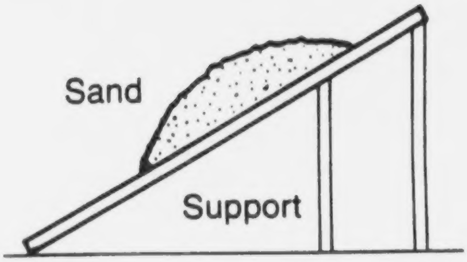
Weather and Agriculture

What Are Natural Resources?

Remarks/Notes

Suggested Activities:

1. **Watersheds or rivers** — Take the 2 × 8's outside to set up this demonstration. Place the sand, gravel, soil and cinder block on separate 2 × 8's. The purpose of the demonstration is for the students to observe the results of a cup of water poured onto each platform. The experiment is to be timed. Pour a cup of water onto the first platform. Note results. Then the second, third and fourth. Then take the cinder block off the board and pour the water directly onto the wood. (This gives you a control of sorts to evaluate the time.) It works better if the platforms are on a slight tilt but observations can be made if they are just in a flat position too.



	Time (min/sec)	**Observations**
Soil		
Sand		
Gravel		
Rock		
Board		

What is the property in the soil which allows more water to be absorbed? ____________

____

Would the soil around a tree absorb more water? Why? ____________

____

What physical science principle is responsible for the flow of water downwards? ____________

____

2. **Water sources and uses in my community** — Instruct the students to interview at least two people to ascertain the sources of water for their community. Then over the weekend have the students record each time they use water. Utilizing the data they have accumulated, have the students show mathematically the amount of water they use during the year. (It is estimated that per capita U.S. citizens use 1,800 gallons of water/day.)
3. **Water pollution** — Discuss with the class what constitutes a water pollutant. Have the students keep a journal for a week in which they will note all their observations of potential and actual causes of water pollution. Have the students then write a recommendation for controlling these local causes of water pollution. They may want to illustrate these reports.
4. **Runoff and drainage patterns activity** — (see page 5) Have students conduct activity.
5. **Animals and water** — (see page 6) Have students read paragraph and answer questions.
6. **Conservation and the water cycle** — (see pages 7 and 8) Diagram the water cycle on the chalkboard. Have students discuss and fill in the missing words.

Runoff and Drainage Patterns Activity

Objective: Students will plot the formation of a drainage pattern.

Materials: Graph paper, pencil and 1 die.

Procedure:

1. Position the paper with the short edges at the top and bottom.
2. Draw an arrow pointing from the upper left hand corner down to the lower left hand corner. (This will be representative of the slope of the landscape.)
3. Place 30 random dots on the upper half of the graph paper. Make the dots where the lines cross. The 30 dots represent 30 droplets of rain.
4. The raindrops move according to these rules:
   a. Roll a die. If the number showing is a
      - 1 or 2, move 1 square down and 1 square to the right
      - 3 or 4, move 1 square down and 1 square to the left.
      - 5 or 6, move 1 square down only.

   b. Move only one drop at a time. Follow the drop's movement by drawing a line.

   c. Begin moving all the raindrops at the top of the paper first. They will soon run into other lower raindrops.

   d. After the raindrops have joined, the two move together. You need to draw two parallel lines to represent the two drops. If 3 drops join, draw 3 parallel lines.

   e. Additionally:
      - 1 drop moves 1 square each turn
      - 2 drops move 2 squares each turn
      - 3 drops move 3 squares each turn
      - and so on

   f. If the path of the drop(s) goes off the paper, forget the drop(s).

   g. Determine the power of the flow of the raindrops by the number of drops in the largest stream.

Conclusion:

Have students compare their charts. Have a class discussion and speculate on the time needed for 30 raindrops to fall during a storm. Now the students could interpret this data to devise a concept pertaining to flash floods.

Follow-up/questions:

1. How does a puddle get made?
2. What determines the speed of a river's flow?
3. Name two things that can cause a flood.

Animals and Water

Animals make what sometimes seem to be incredible adaptations in order to survive in their environments. Take, for example, the desert bighorn sheep:

> The desert bighorn live in dry, sparsely vegetated areas of the Southwest. Temperatures on summer days are frequently over 100ºF. During the hottest months of summer, ewes (females) and lambs come to waterholes almost daily. The male sheep, however, called "rams," sometimes do not come to water for nearly a week at a time. These rams may range 20 miles away from the waterhole, and then travel the 20 miles back again for another drink. Add to this the approximate number of 5 miles traveled per day during the week away from water and you arrive at a figure of almost 75 miles between drinks! The rams are believed to drink approximately 4 gallons of water when they do come to water. Ewes drink about 1 gallon and lambs about 2 pints.

Questions (see answers on page 10)

1. How many miles to the gallon does a ram get? ________________________________
2. How much would an ewe drink in a week? ________________________________
3. How much water would a ram need per month? ______________________________
4. How much water would a lamb drink in a week? _____________________________

Answer the questions using the best fill-in word:

evaporation
ocean
perculation
soil
atmosphere
transpiration

5. Where does the rain water we receive in Ohio come from? Name source ______________
6. The water table receives rain water through the process of ________________________________
7. Clouds are formed by the ________________ of water from the earth's surface.
8. The ____________________________ acts like a sponge and can absorb large amounts of rain water for plants to use.

Adapted with permission from Project Wild.

Name ____________________

Water Conservation — What Have You Learned?

1. Where does water come from? ____________________
2. How is water formed? ____________________
3. Is water a renewable or non-renewable resource? Explain why. ____________________
4. Explain the formation of a rain cloud (you may illustrate). ____________________
5. Explain where the clouds come from that bring rain to Ohio. ____________________
6. List four uses of water. ____________________
7. Describe two sources of community water in your area. ____________________
8. Identify four ill effects of a drought. ____________________
9. Explain what a watershed is and where it is located. ____________________
10. Explain what an aquifer is and explain its importance to the people of Ohio. ____________________

Animals and Water Key

1. 18.75 miles per gallon (ram)
2. ewes drink approximately 7 gallons each week
3. 16 gallons per month (rams)
4. 14 pints (1.75 gallons) (lambs)
5. atmosphere
6. perculation
7. evaporation
8. soil

Water Conservation Key
— What Have You Learned?

1. Water comes from rain. The rain in clouds comes from many sources (transpiration, rivers, streams, respiration, ocean, soil, etc.)
2. The sun's energy transfers water from the sources mentioned in no. 1 to the atmosphere in the form of water vapor. Air masses carry water vapor across the earth and it condenses into rain.
3. Renewable — the water we use stays in the water cycle and is never lost. Little water has ever been lost or added through the ages.
4. Cloud formation (condensation). Water vapor (evaporation from precipitation, combustion, rivers, animals, plants, ocean).
5. The clouds come from the west-southwest.
6. Uses of water (variable answers):
   - a. animals drink it
   - b. plants use it
   - c. fills our oceans, ponds, rivers and streams
   - d. irrigation
   - e. recreation
   - f. transportation
   - g. bathing
7. Community water in your area: (a) underground well, (b) rain.
8. Ill effects of drought:
   - a. loss of yield from crops
   - b. fires
   - c. starvation/thirsting
   - d. loss of wild life
9. An area drained by a river system, source of irrigation water.

10. An underground river, supplies well water for drinking, etc.

Agriculture and
Natural Resources
Unit 31

Weather and Agriculture

Background – Weather and Agriculture

The state of Ohio has a wide range of temperatures, **precipitation**, and wind speeds. These terms are a part of what we call weather on a day to day basis. If we measure these changes through the seasons for a period of years we can describe our climate. Ohio's climate is said to be continental – with a wide range of air temperatures, higher spring and summer rainfall, and less precipitation in the fall and winter. Ohio has no mountain ranges between it and the polar regions, so there is nothing to keep out or slow down the spread of Arctic air from northern Canada. In the summer the warm tropical air from the south and west bring us some hot and humid weather. Storms form on the edges of a cold and warm front which seems to frequently find its way up between the Ohio Valley and the lower Great Lakes.

Normal annual precipitation ranges from a low of 30 inches at Put-in-Bay on Lake Erie to a high of more than 44 inches in Clinton and Highland counties of southwestern Ohio. During the winter the counties to the north and east of Cleveland receive a lot more snow than the rest of Ohio. This is the lake effect. They are said to be in the snowbelt. It takes 10 inches of snow to equal one inch of rain. A rain gauge is used to measure rainfall at any one locaton. Airports are usually designated as the official weather stations.

Average (mean) annual temperatures vary from 49°F in the northeastern part of Ohio to 57°F in the extreme south. The ground temperature is an important measure to predict germination of crop seeds. Some crops like soybeans require a soil temperature of 65°F to **germinate**. It takes warm days and nights to get the best plant growth. The growing season is determined by the number of frost-free days. **Frost free** means no killing freeze temperatures. Lake Erie counties have more frost-free days (200) than the rest of the state. This is one reason why a lot of fruits and vegetables are grown in this area of the state. Lake Erie is a large body of water that holds heat for a longer period of time than our soils. The earliest date with a 50 percent or less chance of frost is April 20, with October 20 being the fall frost date. One hundred forty frost-free days are the fewest number of growing days. These are found in east central Ohio. May 15 to September 30 is the average time period without frost.

Most soils in Ohio are saturated (cannot hold any more water) during the months of March and early April. The rainfall during the growing season ranges from 17 inches along Lake Erie to a high of 25 inches in southern Ohio. Soil moisture declines during June, July, August. By the end of August the soil moisture is usually reduced by 80 percent or more. Where water is readily available some irrigation is used, especially for vegetable and fruit crops.

When we do not get enough rainfall, we are said to be in a drought. When we get too much, rivers and streams flood. People that farm or live around the rivers have to contend with problems that floods bring. Ohio has many flood control dams that have reduced the threat of major flooding but sometimes we still get too much. The following are water equivalents for food production:

Product	**Water Used** (gallons)
Loaf of bread	150
Quart of milk	223
Pound of tomatoes	125
Pound of oranges	47
Pound of potatoes	23
One egg	120

Wind is another factor of weather. Even light winds of less than 5 miles per hour have an undesired effect for farmers spraying and applying fertilizers. During the early growing season, high winds and bare soil often mean soil erosion. Wind also has dangerous effects during severe **thunderstorms**. Excessive moisture can wash large amounts of top soil from farmlands causing **pollution** problems in rivers and streams. Hail can damage and ruin thousands of acres of crops in a short time. The damage includes bruising and breaking of the plant or stripping its leaves off. **Tornados** are frequent unwanted visitors during the spring and summer. Blizzards which are violent cold snowstorms sometimes hit Ohio, but they are not a regular problem.

Lesson: **Weather and Agriculture**

Resouces:

Weather maps showing precipitation and average temperatures; and local newspaper, radio, or TV weather reports and predictions.

Premise:

Many weather factors affect the production of our food and fiber. Some of the more drastic weather conditions cause the greatest losses. Weather affects us all.

Objectives:

1. The student will identify key terms associated with weather and climate.
2. The student will use an Ohio map to identify the differences in precipitation around the state.
3. The student will describe the importance of weather in his/her everyday life for food production.
4. The student will discuss the meaning of weather forecasts.

Motivation:

1. Of all the factors affecting success of agriculture, weather leads the list.
2. Farmers generally cannot enjoy the weather for weather's sake. They must evaluate every change of the weather in terms of its effect on them (crop growth, harvest, water, energy).
3. Discuss that rain for a picnic would be viewed differently than rain for a drought-stricken crop or lawn.

Trivia:

1. In some parts of the U.S., hail can be the size of a softball.
2. We usually think that the North is the coldest, but not so in Ohio; Lake Erie helps keep the counties on its shore warmer, on the average, than the rest of Ohio.

Ag Unit: **Food and Fiber Core**
Major: **Science**
Minor **Language Arts**

Related Lesson Plans

Air
Water Conservation
Soil Conservation

Remarks/Notes

Vocabulary:

1. Precipitation – rain, hail, snow measured in inches
2. Frost-free period – time in days when temperature is above the freezing point (32°F)
3. Erosion – removal of soil by wind or water
4. Germinate – seed sprouting out of dormant stage
5. Frost free – no killing temperatures of 32° or below
6. Thunderstorm – caused by conflicting currents of hot and cold air resulting in sudden, rather severe lightning, thunder, and excessive precipitation.
7. Pollution – degrading quality of air or water with soil or other material
8. Tornado – whirlwind, violent, destructive wind accompanied by funnel-shaped cloud
9. Lows – air pressure usually involved in storm conditions
10. Highs – air pressure usually involving good weather conditions
11. Barometer – instrument for measuring air pressure

Suggested Activities:

1. Begin the lesson by having the students write on the board the types of weather they do not like. Discuss with them the need for rain and snow.
2. Point out that blizzards can cause cattle and livestock losses by the animals freezing to death. Hail can bruise and break off crops. Thunderstorms can wash away topsoil.
3. Relate to the students what today's weather forecast is, and discuss the importance of the weather forecast.
4. Tell the students that some crops need at least 90 to 120 frost-free days to grow and others need 140 days or more.
5. Have the students find and cut out a long-range forecast from the local newspaper. Keep track of the month or week and see if the predictions come true.
6. Watch weather forecasts on TV, take notes and report.
7. Have students complete the worksheet, "Ohio's Rainfall" on page 6.
8. Have students discuss the worksheet, "Weather Station Locations" on page 7.
9. Have students work the "Wordly Weather" hidden puzzle on page 8.
10. Have students look in newspapers and find articles about a country in which the weather is affecting that country's agriculture. Locate this country on a globe or world map.
11. Set up a class weather station with a thermometer, barometer, rain gauge, humidistat, and a wind sock. Have students record their findings each day.
12. Have a weather reporter or meteorologist visit the classroom and explain his/her job and how it works.
13. Visit a weather station at an airport.
14. Have a farmer visit the class and explain how important weather is to successful farming and to the cost of food for everyone.

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

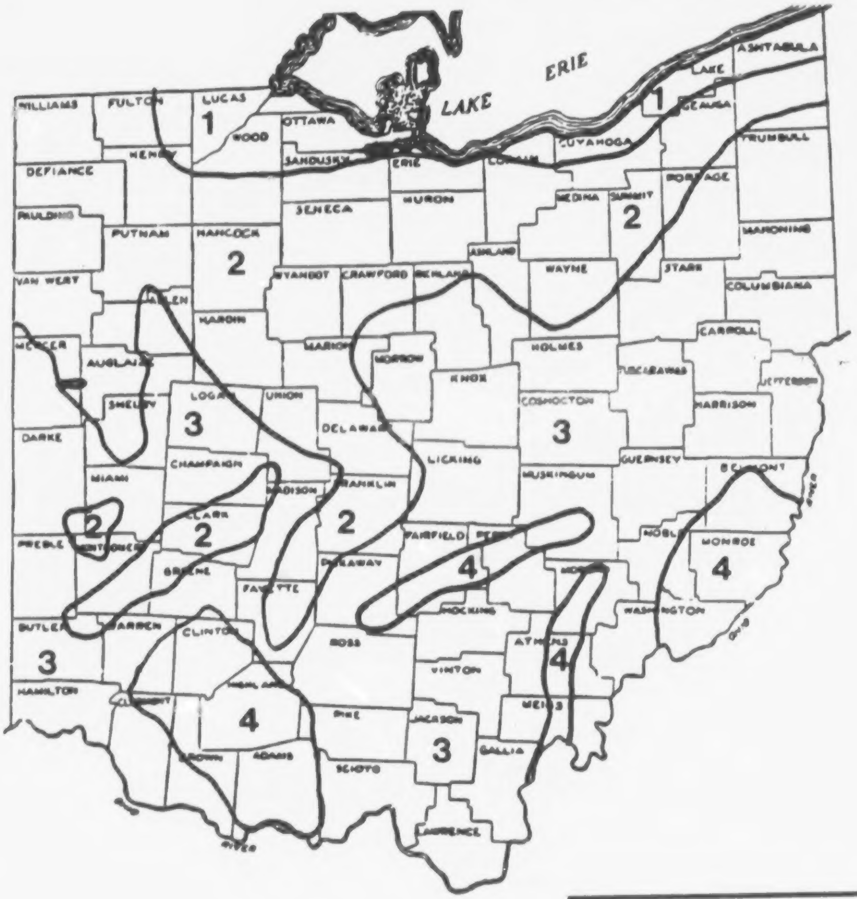
Name ____________________________________

Ohio's Rainfall for the Growing Season

(May - September)

Ohio lies in the Continental Zone which means moderate extremes of heat and cold. Ohio is in a region of westerly winds that bring enough rain for farming, forests, and grazing land. How much rain falls where you live?

____________________________________ inches


LAKE
ERIE
WILLIAMS
FULTON
LUCAS
1
WOOD
OTTAWA
ASHTABULA
LAKE
GEAUGA
1
HENRY
DEFIANCE
SANDUSKY
ERIE
LORAIN
CUYAHOGA
TRUMBULL
PORTAGE
PAULDING
SENECA
HURON
MEDINA
SUMMIT
2
PUTNAM
HANCOCK
2
MAHONING
ASHLAND
VAN WERT
WYANDOT
CRAWFORD
RICHLAND
WAYNE
STARK
COLUMBIANA
ALLEN
HARDIN
CARROLL
MERCER
AUGLAIZE
MARION
MORROW
HOLMES
TUSCARAWAS
JEFFERSON
KNOX
SHELBY
LOGAN
UNION
COSHOCTON
HARRISON
3
3
DARKE
DELAWARE
LICKING
GUERNSEY
BELMONT
CHAMPAIGN
MIAMI
MUSKINGUM
MADISON
FRANKLIN
2
CLARK
2
2
MONTGOMERY
PREBLE
FAIRFIELD
PERRY
NOBLE
MONROE
4
GREENE
PICKAWAY
4
MORGAN
FAYETTE
HOCKING
WASHINGTON
BUTLER
WARREN
CLINTON
ROSS
ATHENS
4
3
VINTON
HAMILTON
CLERMONT
HIGHLAND
4
PIKE
JACKSON
MEIGS
GALLIA
3
BROWN
ADAMS
SCIOTO
LAWRENCE
RIVER
OHIO

1. Color each area on the rainfall key a different color.
2. Match the areas on the map with the same colors you used on the rainfall key.
3. Fill in the blank with the name of your hometown.

____

4. Locate your hometown on the map with a symbol of your choice.

Rainfall Key

1.	less than 19 inches
2.	19 to 21 inches
3.	21 to 23 inches
4.	23 to 25 inches

Name ______________________________

Ohio Weather Station Locations

1. Akron	6. Findlay
2. Cincinnati	7. Lima
3. Cleveland	8. Mt. Vernon
4. Columbus	9. Toledo
5. Dayton	

1. Locate on a map the stations listed above. Tell why they are scattered statewide.

____

____

2. Which ones are located in metropolitan areas? Why do you think they are there?

____

____

3. Is a station near you?

____

4. Do you listen to or watch the weather report?

____

How does the newspaper's report compare with radio and TV?

____

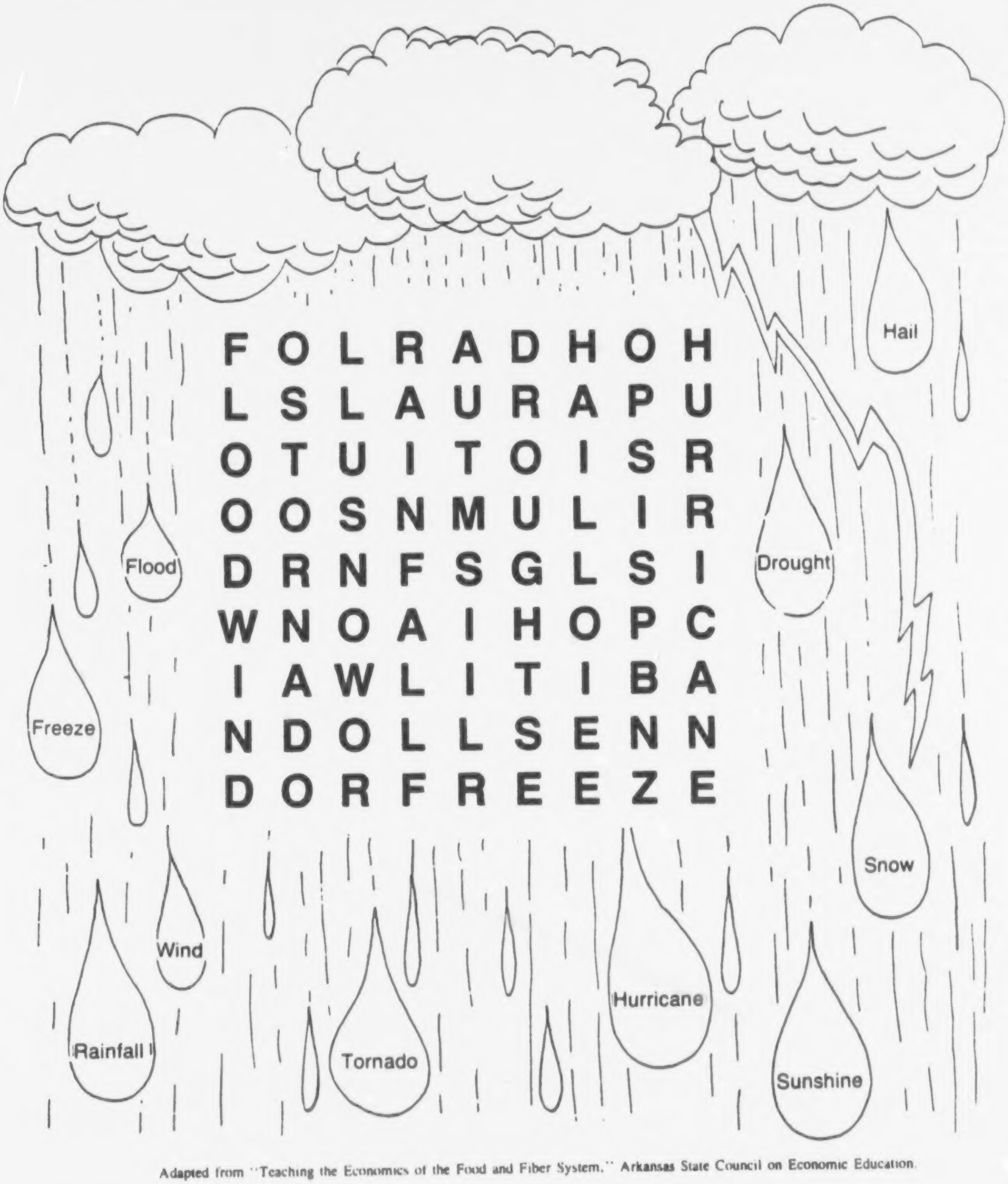
____

LAKE
ERIE
WILLIAMS
FULTON
LUCAS
OTTAWA
WOOD
HENRY
DEFIANCE
SANDUSKY
ERIE
LORAIN
CUYAHOGA
LAKE
GEAUGA
ASHTABULA
TRUMBULL
PAULDING
PUTNAM
HANCOCK
SENECA
HURON
PORTAGE
MAHONING
VAN WERT
ALLEN
WAYNE
STARK
COLUMBIANA
MERCER
AUGLAIZE
MARION
HOLMES
CARROLL
SHELBY
LOGAN
UNION
KNOX
TUSCARAWAS
JEFFERSON
DARKE
DELAWARE
COSHOCTON
HARRISON
MIAMI
CHAMPAIGN
FRANKLIN
LICKING
BELMONT
CLARK
FAIRFIELD
PERRY
PREBLE
MONTGOMERY
GREENE
FAYETTE
MORGAN
MONROE
BUTLER
WARREN
CLINTON
ROSS
ATHENS
WASHINGTON
HAMILTON
CLERMONT
HIGHLAND
VINTON
MEIGS
PIKE
JACKSON
BROWN
ADAMS
SCIOTO
GALLIA
LAWRENCE

Name ______________________

Worldly Weather

Locate the weather words in the hidden puzzle.


Hail
Flood
Drought
Freeze
Snow
Wind
Hurricane
Rainfall
Tornado
Sunshine

F	O	L	R	A	D	H	O	H
L	S	L	A	U	R	A	P	U
O	T	U	I	T	O	I	S	R
O	O	S	N	M	U	L	I	R
D	R	N	F	S	G	L	S	I
W	N	O	A	I	H	O	P	C
I	A	W	L	I	T	I	B	A
N	D	O	L	L	S	E	N	N
D	O	R	F	R	E	E	Z	E

Adapted from "Teaching the Economics of the Food and Fiber System," Arkansas State Council on Economic Education.

Name ______________________

Weather and Agriculture
— What Have You Learned?

Describe how the following weather conditions affects the farmer.

1. Drought: ____
____
2. Flood: ____
____
3. Blizzard: ____
____
4. Hail: ____
____
5. High temperatures: ______________________________________
____
6. Strong winds: ____
____
7. Frost: _____________________________
____
8. Low snowfall: _________________________
____
9. Low temperatures: _______________________
____

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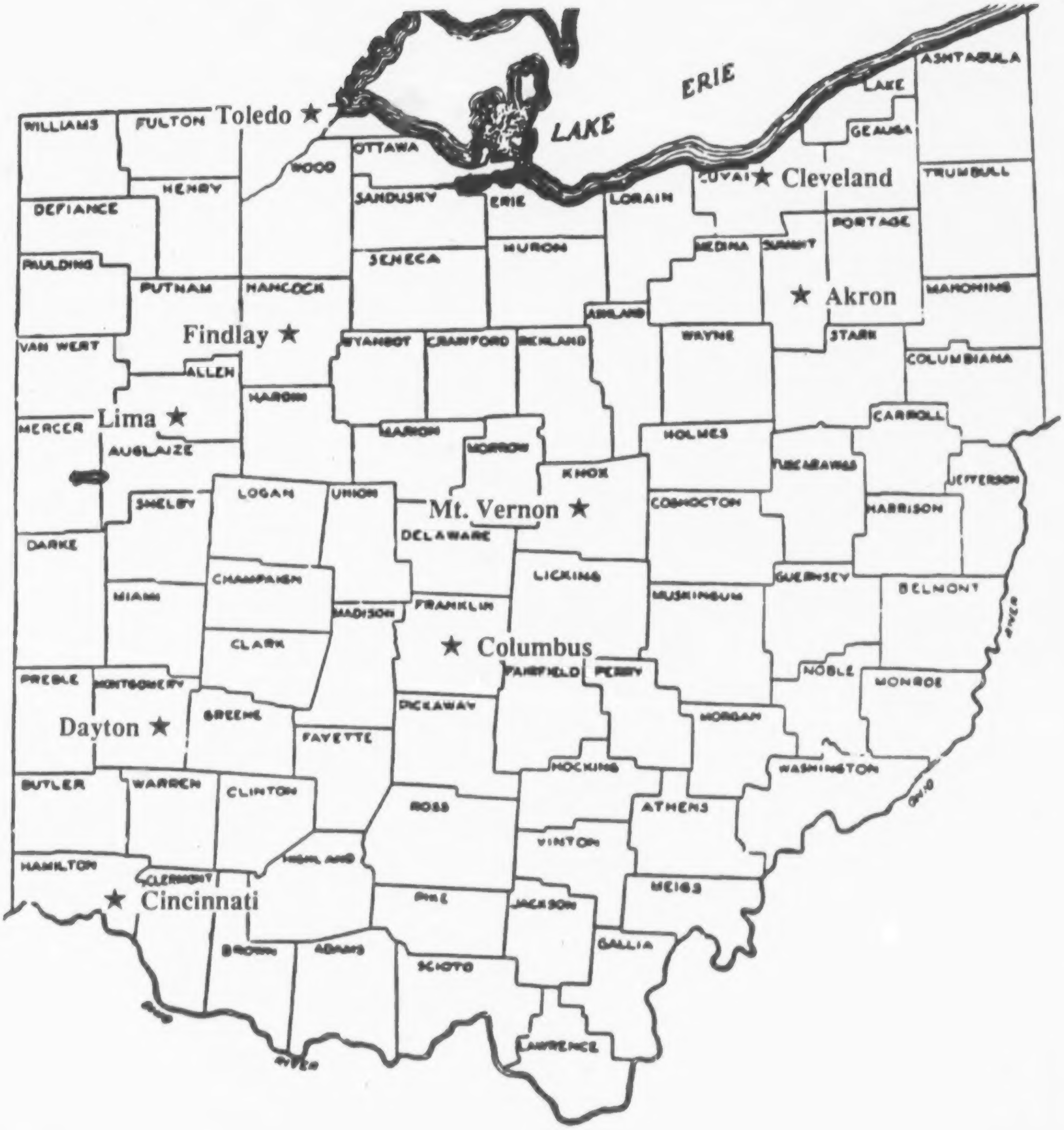
U.S. DEPARTMENT OF AGRICULTURE

9

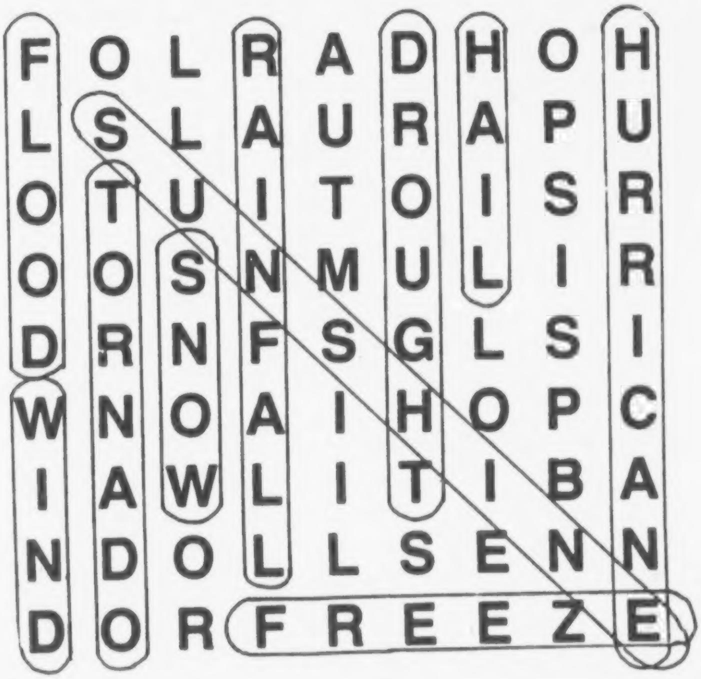
Key – Ohio Weather Station Locations


LAKE ERIE
Toledo ★
★ Cleveland
★ Akron
Findlay ★
Lima ★
Mt. Vernon ★
★ Columbus
Dayton ★
★ Cincinnati
WILLIAMS
FULTON
OTTAWA
WOOD
LAKE
ASHTABULA
GEAUGA
CUYAHOGA
TRUMBULL
HENRY
DEFIANCE
SANDUSKY
ERIE
LORAIN
PORTAGE
SENECA
HURON
MEDINA
SUMMIT
PAULDING
PUTNAM
HANCOCK
ASHLAND
MAHONING
VAN WERT
WYANDOT
CRAWFORD
RICHLAND
WAYNE
STARK
COLUMBIANA
ALLEN
HARDIN
CARROLL
MERCER
AUGLAIZE
MARION
MORROW
HOLMES
TUSCARAWAS
KNOX
JEFFERSON
SHELBY
LOGAN
UNION
COSHOCTON
HARRISON
DELAWARE
DARKE
LICKING
GUERNSEY
BELMONT
MIAMI
CHAMPAIGN
MUSKINGUM
MADISON
FRANKLIN
CLARK
NOBLE
MONROE
PREBLE
MONTGOMERY
FAIRFIELD
PERRY
GREENE
PICKAWAY
MORGAN
FAYETTE
WASHINGTON
HOCKING
BUTLER
WARREN
CLINTON
ROSS
ATHENS
OHIO RIVER
VINTON
HAMILTON
HIGHLAND
CLERMONT
MEIGS
PIKE
JACKSON
GALLIA
BROWN
ADAMS
SCIOTO
LAWRENCE
OHIO RIVER

Weather and Agriculture Key —
What Have You Learned?

1. Low water supply can cut crop yields or cause a total crop failure. A severe drought could cause a low water table, affect levels in wells and affect drinking water for livestock and humans.
2. Floods can drown crops and livestock. Too much water for too long can affect a farmer controlling weeds in the crop fields and also cause loss of crop plants.
3. A blizzard can cause death of unsheltered livestock by suffocating or freezing them and covering their food supply.
4. Hail can cause damage to crops, livestock, equipment and buildings.
5. High temperatures can cause crops to wither and place heavy demands on water for crops and livestock. It can cause heat stroke in livestock and humans.
6. Strong winds can cause plants to bend over or break off. Also winds can damage buildings and equipment.
7. Frost can kill crops in early stages of growth or before they are mature. If not killed the crops are damaged thereby reducing yields. Frost is especially critical in states where it is not expected, i.e. orange groves in Florida. Potatoes and fruit trees are frequently affected in Idaho.
8. Low snowfall places a tremendous strain on the water supply for irrigation. The snowfall in the mountains is extremely important for Idaho's summer water supplies.
9. Extremely cold temperatures can affect winter wheat crops in Idaho. If there is not a snow cover, cold temperatures combined with winds can kill the small, tender wheat plants.

Worldly Weather — Key



F	O	L	R	A	D	H	O	H
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O	T	U	I	T	O	I	S	R
O	O	S	N	M	U	L	I	R
D	R	N	F	S	G	L	S	I
W	N	O	A	I	H	O	P	C
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N	D	O	L	L	S	E	N	N
D	O	R	F	R	E	E	Z	E

Agriculture and
Natural Resources
Unit 32

Soils

Background — Soils

Soil is the relatively loose material that constitutes the outermost layer of the earth's land mass. It provides food and water and physical support for plants that provide us with food and fiber. We build houses and other structures on it. It produces timber for building, range for livestock grazing, and is necessary for much of our recreation uses. We mine mineral resources from beneath it.

Seemingly unchanging and lifeless, soils are really a dynamic system, teeming with life. One teaspoon of soil in the temperate regions of the world can contain millions of organisms ranging from simple bacteria and fungi to more advanced forms of life. The advanced forms of life may include plant roots, earthworms, insects and spiders. **Bedrock** or other soil parent materials are continually fractured, dissolved and changed to form soil. Other materials from which soils are formed include materials transported and deposited by water, wind or glaciers. Soil layers deep in the profile and rock materials change very slowly.

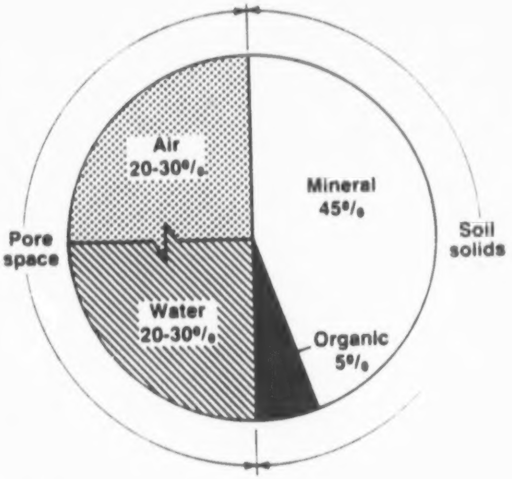
The soil forming process occurs very slowly as most of our soils are thousands of years old. New soils are continually being formed, so in a sense soils are a renewable resource. However, because it takes hundreds of years to form an inch of soils, in our lifetime they are not renewable. Wind and water erosion can remove an inch of topsoil in a single year. When a soil erodes excessively, the exposed lower horizons are more difficult to cultivate and less productive for plant growth.

Soil is a naturally occurring mixture made up of about 50 percent solid particles and about 50 percent open space between the solid particles (pores). The pores are filled with either water or air depending on amounts of water from precipitation or irrigation and water use by plants, evaporation and other factors. As water in the pores is depleted, air from the atmosphere moves in to fill the pores. Too much water and plants cannot get enough air.

Thus the composition by volume of the soil:

Solid material (50%)
45% = Mineral particles of various sizes (clay, silt, **sand,** rock)
5% = Organic matter or humus (both living and dead organisms)

Pores (50%)
Vary in air and water content with little water and lots of air in dry soil and lots of water and little air in wet soils.



The 45 percent mineral or solid particles of a soil is produced from parent material from which the soil was formed. The solid particles are classed into three size groups — sand, silt or clay. Sand particles range in size from 2 to 0.05 mm and are easily seen with the unaided eye. [In case you are not familiar with the metric system, one millimeter (mm) is about the thickness of a dime.] Silt particles are between 0.05 and 0.002 mm in size. Clay particles are smaller than 0.002 mm.

The different particle sizes can be distinguished by "feel," using the thumb and fingers. In most cases the "feel" method works best when the soil is moistened with water to make a stiff paste. **Sand** particles feel gritty and do not stick together. **Silt** particles feel very smooth and when dry are very much like flour. **Clay** particles are very sticky when wet and can be shaped much like modeling clay. After clay has dried it becomes very hard and is difficult to break. Clay particles are the most reactive mineral fraction in the soil. When stirred up in water, clay particles are so small that they stay in suspension for hours or even days.

Soil organic matter or "humus" is the most reactive portion of the soil. It is comprised of dead plant and animal material. It forms when the billions of living organisms that inhabit the soil work to decompose plant residues. Soil humus is an important source of plant nutrients. It provides the soil good water holding capacity and favorable tilth. If you examine a soil in a pit or road cut you will be looking at what is called a soil profile. A soil profile is a sequence of soil layers, called horizons, usually extending several feet down from the earth's surface. Some horizons are less than an inch thick while others may be 2 feet or more thick. By studying soil profiles, scientists learn about the soil, its characteristics, and how best to use and protect it.

The texture of a soil is determined by the relative amounts of sand, silt and clay particles in the soil. For example, a silt loam soil may contain about 15 percent clay, 10 percent sand and 75 percent silt. Loam soils contain about equal amounts (30 to 50%) of silt and sand and lesser amounts (10 to 25%) of clay.

Soil Forming Processes

The world has thousands of different soils. The different soils are a result of a combination of five important soil forming factors — parent material, living organisms, topography, climate and time. The five soil forming processes are all interrelated. Each interacts with the others. A slight change in one of the factors results in a change in the final soil formed.

Parent Material

Parent materials are the rock or other geological materials from which soil is formed. Parent material in Ohio is basically from the following three types of sedimentary rock formations:

- limestone
- shale
- sandstone

Glacial drift and sediment coverage account for a major part of our state's soil types. Each different kind of parent material provides different characteristics in the soil developed.

Climate

Parent material is altered or broken down into finer particles by a process called weathering. Weathering is the result of the climate at a given location. Temperature and water are major climatic forces that influence weathering. Water from precipitation dissolves certain minerals from parent material and moves them down through the profile to be redeposited at lower depths. Water is also a necessary component of chemical reactions that take place in the soil. These chemical reactions result in changing the chemical components of the soil.

Expansion of water freezing in cracks of rocks exerts pressures which fracture the rocks. Freezing and thawing or heating and cooling also break down particles because not all minerals expand and contract at the same rate.

Living Organisms

Both plants and animals help to create a soil. As they die, plants and animals add organic matter to weathered parent material to help form topsoil. Plant roots also alter the soil in forming acids that enhance the chemical processes in the soil. Root growth also can physically break apart rocks as roots enter into cracks in rocks, and as the plant grows the expanding roots widen the crack.

As animals dig through the soil, they mix it, permitting air and water to more readily enter the profile. They mix the organic matter throughout the soil. Smaller plants and animals (bacteria, fungi and nematodes, for instance) also enrich soil by breaking down organic matter to provide more plant available forms of nutrients.

Topography

Topography is the surface configuration of the land. Slope or the steepness of the land is one of the most important factors. The steepness of the slope determines how much water runs off and how much soil material is lost or moved down the slope. The more water lost to runoff the less water for plant growth, and less plant growth means less organic matter. Thus soils vary with topography primarily because of the influence of moisture and erosion. Soils located in low areas and depressions are often poorly drained.

Time

Soil forming processes are very slow. Most of our soils have obtained their present form over a period of thousands or even millions of years. This is why it is so critical to prevent soil erosion, as our highly productive soils, which took many thousands of years to form, can be completely lost in only a few years time.

Lesson: **Soils**

Resources:

Soil, water can, 1 qt jar with lid, dishwasher detergent, sawdust, cotton or peat moss.

Premise:

Soil is important to agriculture. Without it there is no crop production, rangeland or timber. Without these we would have no food or shelter.

Objectives:

1. Understand role of soils in agricultural production.
2. Learn that soil particles make-up soil.

Specific things to look for:

1. How soil works for you.
2. The care soil needs.
3. Imagine a world with no soil.
4. How weathering of rocks makes soil.
5. How plants are connected to the earth.
6. How organic material works in the soil.

Motivation:

How much do the students know about soils?

1. What is soil? (The surface layer of the earth supporting plant life.)
2. What is the earth made of? (soil, rocks, air, water, etc.)
3. What are the different soil particles? (clay, sand, silt)
4. What are the different soil textures? (loam, silt loam, sandy loam, etc.)

Vocabulary:

1. Soil — A dynamic system composed of mineral, organic material, air and water that serves as a medium for plant growth
2. Sand — Loose, granular particles worn from rock (largest of soil particles)
3. Silt — A soil particle between sand and clay
4. Clay — The smallest soil particle, sometimes used to make pots and bricks
5. Bedrock — Parent material from which soil is made

Trivia:

1. An acre of soil 6 inches deep weighs 2 million pounds.
2. One cubic foot of soil weighs approximately 92 pounds.
3. Soil scientists have identified over 70,000 kinds of soils in the United States. Ohio has over 400 different soils.
4. One earthworm can digest 36 tons of soil in one year.
5. Glaciers have helped to form soils in a large part of Ohio.

Ag Unit: **Food and Fiber**

Core

Major: **Science**

Minor:

Related Lesson Plans

Plant Growth

Soil Conservation

Water Conservation

What Are Natural Resources?

Remarks/Notes

Suggested Activities:

1. Ask your students what is soil. Draw three circles on the board, one big 1 foot across, one medium 2 inches across and one a dot. Tell them these represent the particles in soil — sand, silt and clay. Explain that all plants grow from minerals and chemicals in the soil, and the food we eat comes from these minerals and chemicals.
2. Laboratory activity:
   a. Collect some soil from a site around the school. (Be sure to dig down to the 10-inch level for a cross section of the surface soil.)
   b. Fill a quart jar with ⅔ water and pour in 1 cup soil. (Be sure there are no clods in the sample.)
   c. Add 3 tablespoons of non-sudsing (dishwasher) detergent to each jar.
   d. Cover the jar and shake hard, then shake again in 10 minutes.
   e. Place the jar where it won't be disturbed and watch it.
   f. Have the students write down what they see happening.
3. Invite a potter or ceramics teacher to Career Day for a demonstration. Also, a Soil Conservation Service specialist would be a good resource person to invite to class. An SCS office is located in every county in Ohio.
4. Demonstrate plant root growth by lining the inside of a pint or a quart jar with paper towels. Fill the jar with peat moss, cotton, vermiculite or sawdust. Put an inch of water in the jar and place bean, pumpkin or corn seeds between the paper and the jar. Keep the jar warm and moist. Have students observe plant growth.
5. Use transparency masters (1) A Soil Profile and (2) A Soil Ecosystem.

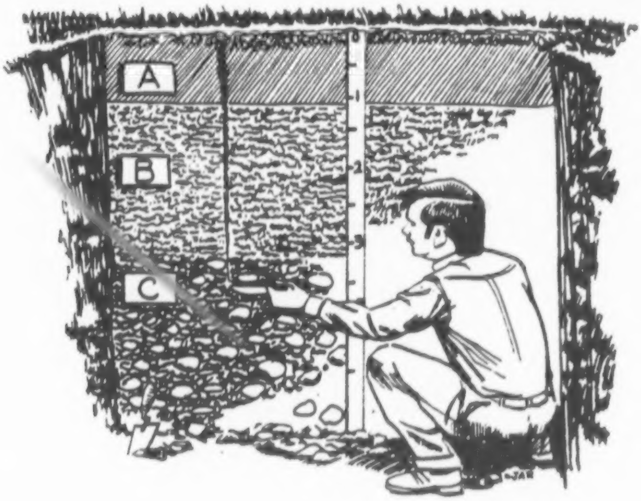
Name ________________________

Soils — What Have You Learned?

Use the word bank and complete the following statements:

clay
slow
soil profile
sand
parent material
organic matter

1. Soils are made up of sand, silt and ________________________.
2. The largest soil particle is ________________________.
3. A sequence of soil layers is called a ________________________.
4. Soil forming processes are very ________________________.
5. Plants die and form ________________________.
6. Soil forms from the weathering of ________________________.



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Soils Key — What Have You Learned?

1. Soils are made up of sand, silt and **clay**.
2. The largest soil particle is **sand**.
3. A sequence of soil layers is called a **soil profile**.
4. Soil forming processes are very **slow**.
5. Plants die and form **organic matter**.
6. Soil forms from the weathering of **parent material**.

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Agriculture and
Natural Resources
Unit 33

Soil Conservation

Background – Soil Conservation

Reports are made each year about the number of acres that have been lost to production because of **soil erosion**. We know about the hard times farmers suffered during the Dust Bowl days. But do we know the causes of these events? (See page 13.)

Soil conservation is an effort to ensure that our native, fertile soil remains productive. The federal government has established an agency of the United States Department of Agriculture (Soil Conservation Service) to guard this precious resource and to assist the public in practices of soil management. Soil is important to each and every one of us. We depend upon it to produce our food, fiber, and often our shelter.

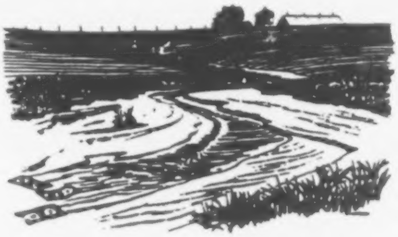
In order to practice soil conservation, we need to understand what soil is, what its properties are and the forces that cause soil erosion. Erosion is the wearing away of the soil by water, wind, and other forces. Soil erosion is the greatest threat to the soil productivity in the United States and the largest source of pollutants in our waterways.

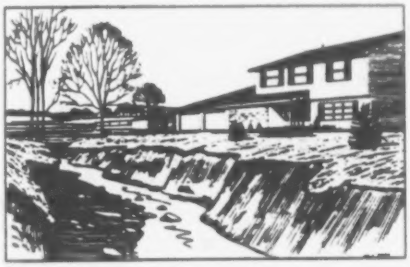
Water causes about two-thirds of the erosion of our agricultural land. Rainfall is most erosive when intensive rains coincide with the time the soil is bare. This is usually in spring and early summer when most fields have been recently tilled.The rate of erosion can be slowed by living plants and plant residue, and bits of rock on the surface of the soil, which intercept falling raindrops.

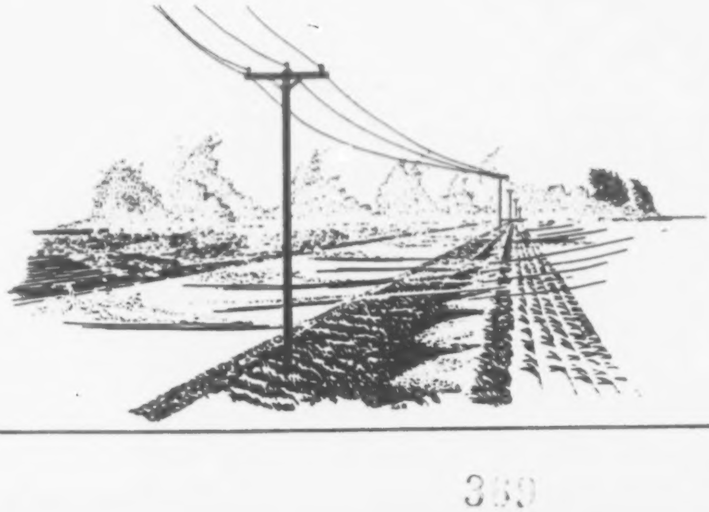
Wind also causes erosion of topsoil. The wind picks up small particles of soil and carries them away.

Nearly all erosion control is the work of farmers and other land users who voluntarily conserve the soil. However, soil erosion is not just a farm problem. Urban areas under construction, road banks, rights-of-way, and even your own backyard can be potential sites for erosion problems.

Erosion control is an investment in the future for everyone. The land's productivity can be safeguarded while streams and rivers are protected when we all practice conservation measures.







Lesson: **Soil Conservation**

Resources:

Sand, gravel, potting soil, pea or bean seeds, paper cups, fertilizer, grow lights, and zip-lock baggies.

Premise:

Topsoil contains available nutrients to sustain plant growth. This valuable resource is responsible for our ability to feed and clothe ourselves.

Objectives:

1. The student will learn that topsoil contains nutrients which are important if maximum plant production is to occur.
2. The student will be able to demonstrate how water erodes soil.
3. The student will be able to illustrate one effective method to retard water-caused soil erosion.
4. The student will learn an appreciation for soil conservation efforts.

Motivation:

Ask the students whether soil is a renewable or non-renewable resource. (In a sense, soils are renewable. Because it takes hundreds of years to form an inch of soil, however, in our lifetime soil is a non-renewable resource.)

Vocabulary:

1. Soil erosion — the removal of soil by wind, water or other forces
2. Topsoil — the upper layer of soil that contains high amounts of organic matter and nutrients and minerals necessary for plant growth
3. Contour farming – the tillage method that retards runoff or water erosion by tilling across the slope.
4. Soil profile – a sequence of soil layers
5. Nutrients – minerals of plant food necessary for plant growth
6. No-till farming – all crop residue is left on the soil surface; new crops are planted through this residue.
7. Conservation tillage – any of several methods of crop production that minimize soil loss.

Trivia:

1. The weight of an acre of soil 1 inch deep is approximately 150 to 170 tons.
2. Annual soil erosion losses in Ohio are estimated at over 66 million tons, or enough to fill OSU's football stadium over 50 times.

Ag Unit: **Natural Resources**

Core

Major: **Science**

Minor: **History, Language Arts, Social Studies**

Related Lesson Plans

Crop Production Steps

Soils

Water Conservation

Weather and Agriculture

What Are Natural Resources?

Remarks/Notes

Suggested Activities:

1. **Topsoil's Importance** — To demonstrate the importance of topsoil, the students will conduct this study for approximately 4 weeks. Have the students form teams and ask them if they would like to be a sand team, a gravel team, a water team or a topsoil team. Distribute paper cups, growing medium and seeds to the teams. Have the students moisten their growing medium and plant their seeds. The water team needs just a few drops of water in their baggies for the seeds to germinate. Place plant containers either on a windowsill or under grow lights. After a week, select one of the sand or gravel groups to be given the opportunity to use the fertilizer for their seedings. Ask the class why this is beneficial. At this time, the students should begin a daily log on the progress of their plant's growth. The water group will lose their seedlings. Daily watering will not be necessary, but instruct the students on how to check for dryness.

   At the end of the 4 weeks, have each student-team give an oral report on their experiment and explain why or why not their crop was a success.

2. **Clay, Silt, Sand?** — Ask the students to gather two samples of soil from their yards at home. These need to be about a cup each. Have the students add enough water to each sample and mix in old milk cartons until all the sample is moist. Number each soil sample and place around the room. Instruct the students to first walk around the room noting each soil sample by number, color and smell. Then they are to guess if the sample is a clay, silt or sand. At your desk have available good samples of a clay, silt and sand soil and instruct the students as to their properties. (For assistance with this you may contact a County Extension Agent or the Soil Conservation Service in your area.) Rubbing the sample between the index finger and thumb provides the students with an unforgettable imprint of the soil particle size. Have the students dump the samples out onto paper towels, with numbers still visible. Once again have the students go around the room, test the samples, make guesses and record data. This is not an exercise in finding the right number but rather is a means to see how many changed their guess after they used another one of their senses (feel).

3. The Earth as an Apple (page 5). Conduct activity with students. Students could create a graph to depict portions of earth and how we use it.
4. Compare how much water different soils hold (page 6).
5. How does crop cover affect soil loss (page 7)?
6. How does mulch prevent soil loss (page 8)?
7. What does contouring do (page 9)?
8. Make splash boards to study splash erosion (page 10).
9. Why conserve soils (page 11)?
10. Soil erosion: How it affects us (page 13).
11. Have students learn the Conservation Pledge (page 14).

The Earth as an Apple

Consider the earth as an apple. Imagine the following sequence.

Slice an apple into quarters. Set aside three of the quarters. These represent the oceans of the world. The fourth quarter roughly represents the total land area left.

Slice this land quarter in half, giving you two 1/8th world pieces. Set aside one of the pieces. This is land inhospitable to people (the polar areas, deserts, swamps, very high or rocky, mountainous areas). The other 1/8th piece is the land area where people live, but not necessarily grow the foods needed for life.

Now slice this 1/8th piece into four sections, giving you four 1/32nd pieces. Set aside three of these pieces. These are areas too rocky, too wet, too cold, too steep, or with soil too poor to actually produce food. They also include the areas of land that could produce food but are buried under cities, highways, suburban developments, shopping centers and other structures that people have built.

This leaves us with a 1/32nd slice of the earth. Carefuly peel this slice. This tiny bit of peeling represents the surface, the very thin skin of the earth's crust upon which humans depend. Also, this bit of peeling represents the amount of soil which is used for food production to feed the world. Less than 5 feet deep, it is quite a fixed amount of food-producing land.

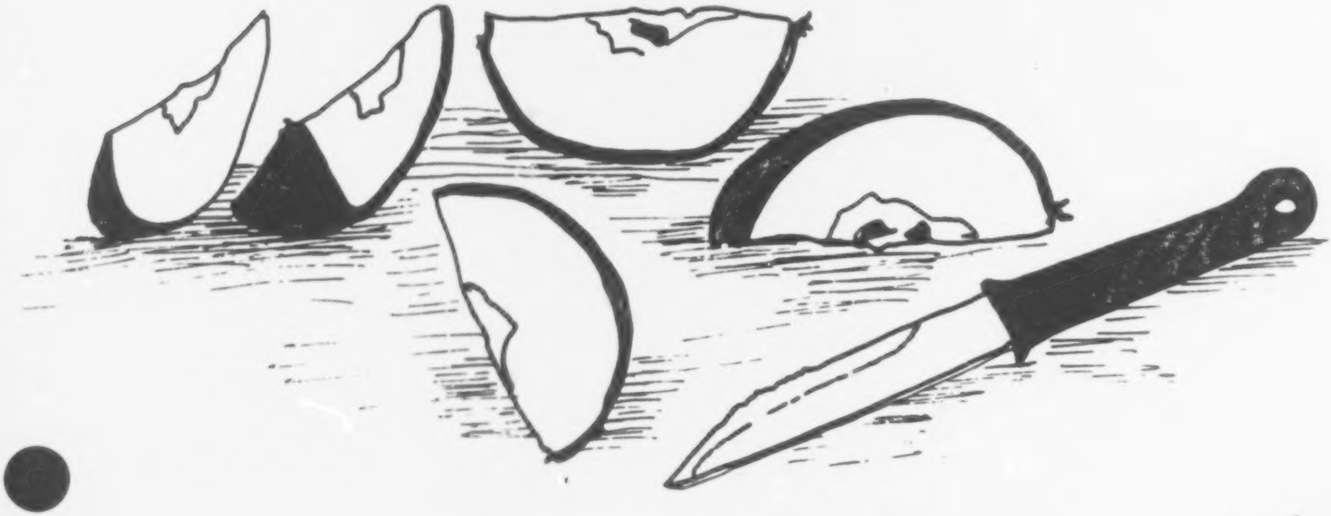
Now you realize that protecting our land resources is important too. Advanced agricultural technology has enabled the world to feed many of its people. But, with a fixed land resource base and an ever increasing number of people trying to feed themselves from the fixed base, each person's portion becomes smaller and smaller and more important to the individual person. We must protect the environmental quality of our air, water, and land.

Water by Percent

97.20 salt water
2.15 ice
0.63 ground water
0.02 surface water (lakes, rivers)

Inner Apple

Red (crust)
1/2 fruit (mantle)
1/2 fruit (outer core)
core (inner core)



Compare How Much Water Different Soils Hold

You will need 2 cans of equal size (coffee cans will do); two 18-inch squares of cloth; some heavy string; a package or similar scale that weighs up to 64 ounces or 2,000 grams; and a container of water, such as a 2- or 3-gallon bucket or a 5-quart oilcan with the top cut out.

Put equal volumes of soil in the two cans. Take the soil for one from a field or garden that has been cultivated for several years and that shows lack of organic matter. This sample should be hard and cloddy. Get the other from a well-managed field where grasses and legumes have been grown, or from a good pasture or similar location. This sample should be crumbly and free from clods.

First allow the soils to dry.

Empty the two soil samples on the cloth squares, pull the corners together, and tie with a heavy string. Weigh each sample and record the weight.

Saturate each bag of soil by holding it in the water long enough to soak thoroughly. Remove the soil samples from the water and allow them to drain off the free water for a few minutes. Then weigh again and record the weights.

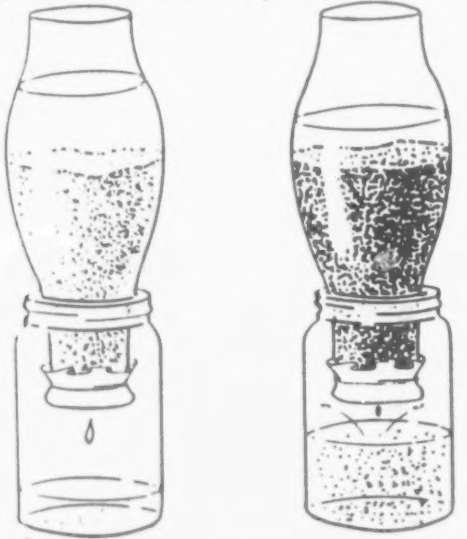
Calculate the difference in weight.

Another way to measure the water-holding capacity of soils is to use two old-fashioned lamp chimneys or cylinders as in the previous activity. Tie a cloth over the top, turn them upside down, and fill them about two-thirds full with the same two soils.

Be sure the soils are equally dry.

Place the chimneys in small-mouth fruit jars, as shown in the drawing.

Pour a pint of water into each chimney. Then note how long it takes the water to begin to drip into the jars, how much water comes from each soil and how long the water continues to drip.



Interpretation

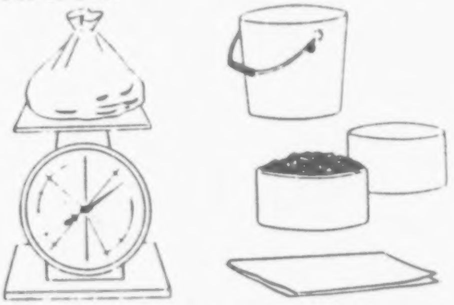
When organic matter is used up, soil packs together. Thus, a cloddy soil has fewer air spaces so particles do not cling together in granules, and the lack of organic matter means that it weighs more than an equal amount of crumbly soil from a well-managed plot.

Not only does a crumbly soil take in water faster than a cloddy one, it holds more. The thoroughly decomposed organic matter (humus) in a crumbly soil can absorb lots of water. On a dry-weight basis, this humus has a water-holding capacity of several hundred percent and may act like a sponge. In addition to the water held by the organic matter itself is the water held in the pores between the soil particles and between the soil granules. Hundreds of very fine soil particles are glued together by the organic matter into soil granules.

This increased water-holding capacity of soils high in organic matter under natural conditions makes a big difference in the intake of water. These well-managed soils can absorb most of the rain and snowmelt (if the soil is not frozen). This means there will be less erosion. Streams will run clear. Of course, when the soil is saturated by a long period of rainfall, any additional water then runs off. But until the soil is saturated it will store up water and let it go gradually. The result is that floods are less severe, water seeps to streams slowly and over a longer period of time, and water is stored in the soil for plants to use.

Crops use lots of water. Vegetables use an average of 2 acre-feet, or 650,000 gallons an acre. Cotton takes 800,000 gallons per acre. An acre of alfalfa needs over a million gallons. To produce one ear of corn takes over a barrel of water. Organic matter helps soil store more water and thus helps prevent erosion and produce better crops.

Many field tests have shown the improved water-holding capacity of well-managed soils that have enough organic matter to keep them crumbly and granulated. One deep soil in Texas that was high in organic mattter held 25 percent or 1 inch more water in the 1-foot surface layer, after the free water had drained off, than the same depth and type of soil in another field where the soil was low in organic matter. This made a difference of 27,000 gallons of water per acre in the first foot of soil.



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U.S. Department of Agriculture, PA-341.

How Does Crop Cover Affect Soil Loss?

On land that must be cultivated and cannot be kept in grass all the time, farmers can keep the land covered as much of the time as possible by using crop rotations. By growing a cultivated crop like corn followed by a small grain crop and one or more years of grass-legume meadow, the land can be covered much of the time. Mulches can help gardens.

You will need two small boxes about 16 inches long, 12 inches wide and 4 inches deep. (These boxes can be used for several activities so they are worth making and keeping on hand.) Make them watertight by lining them with plastic material, tin or tar paper.

At one end of each box cut a V-notch 1- to 1½-inches deep and fit with a tin spout to draw runoff water into a container (see drawing).

You will also need two flower sprinklers, at least a quart in size (half gallon or better), two half-gallon wide mouth fruit jars and two sticks of wood about 1 inch thick.

Cut a piece of sod from a pasture, lawn, fence row, or the like, to fit one of the boxes. Trim the grass with scissors so that it is not more than an inch high. This makes it easier to handle.

Fill the other box with soil from the same place — no grass, just soil, but don't try to pick a very poor soil. The idea is to have the same kind of soil in the boxes — one with grass, the other bare.

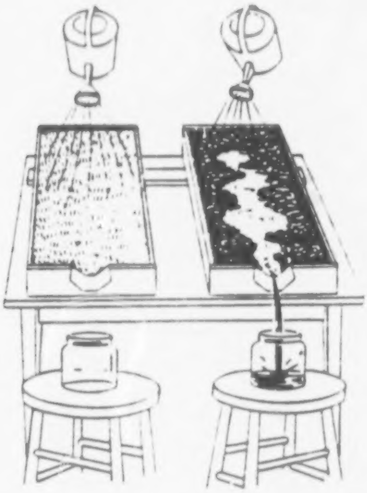
Set the boxes on a table so that the spouts extend over the edge. Place the sticks under the other end to give them slope.

Put the empty fruit jars on stools placed beneath the spouts.

Fill the two sprinklers with water and pour the water on both boxes at the same time. Pour steadily and at the same rate for both boxes. Hold the sprinklers the same height from the boxes. About a foot will be satisfactory, although you can get various results from different heights.

Interpretation

You will find that water will rush off the bare soil into the fruit jar, taking soil with it. The flow will stop soon, but the jar will contain muddy water.



The water that flows from the sod will be reasonably clear. It will take longer for the flow to start and it will continue longer. Also, not as much water will reach the jar. The amount of water in the two samples before the experiment will affect the results somewhat. Unless the soils are waterlogged, however, the activity will be successful. The samples need not be completely dry.

This activity illustrates one of the most fundamental principles of soil and water conservation — the protection grass gives sloped soil against the pounding of raindrops and the movement of running water.

The grass breaks the force of the raindrops so that the soil is not pounded and broken apart by this impact. The grass roots open up channels to let water get into the soil. Organic matter furnished by decayed grass crops also lets water enter more readily, as we learned in "Compare How Much Water Different Soils Hold." And as the water runs off, the stems of grass slow it down so that it does not have enough speed to disturb the soil.

Experiments show this is true. For example, on one plot at La Crosse, Wis., where corn had been grown every year for 6 years, the annual soil loss was 89 tons per acre. On a plot in bluegrass sod, however, the annual soil loss was only 0.2 ton per acre.

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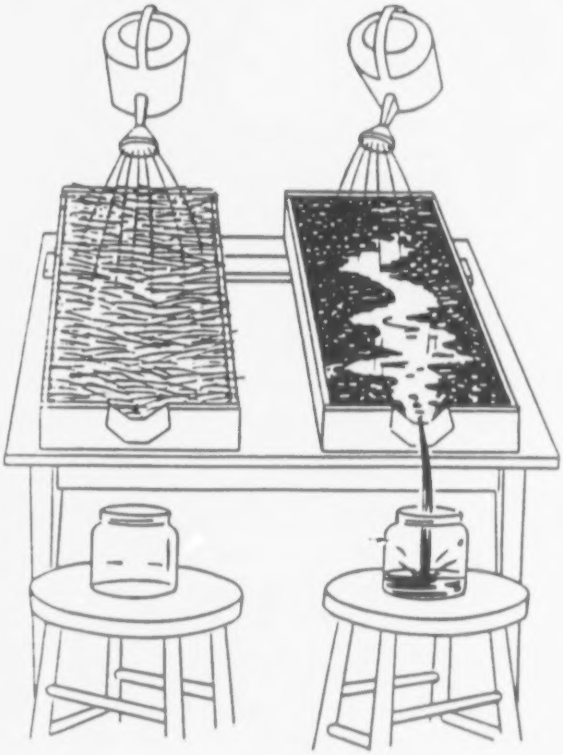
How Does Mulch Prevent Soil Loss?



Use the same boxes you made for "How Does Crop Cover Affect Soil Loss?" This time fill them both with the same kind of soil.

Set them on the table as before, placing the sticks under one end to make a slope.

Cover one box of soil with a thin layer of straw, grass, wood shavings or sawdust; leave the other bare. Sprinkle water on both boxes, using the same amount of water and pouring at the same rate from an equal height.

Note how much and how fast water runs off into each fruit jar.

Another way to study the protection of mulches on the soil is to drop water from a short height on soil that is not protected and on soil that is protected with mulch.

For this you will need two small tin cans. With an 8-penny nail, punch a hole in the bottom of each can and fill the hole loosely with cotton.

Put one-half inch of soil in two small fruit jars or water glasses. Put a light layer of dry grass clippings on one of the soil samples. Leave the other one bare.

Arrange the tin cans so that they are about 4 feet above the jars of soil. Put about one-half inch of water in the cans. Large drops of water will form through the holes in the cans and drop on the soil in the jars. Note the amount of soil that is splashed on the sides of the glass.

The third activity shows the effect of mulch on water intake of soil as well as the value of mulch in conserving soil and water.

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What Does Contouring Do?

Fill both boxes used in previous activities with soil taken from the same place. Set them on a table and place sticks under the ends to make a slope. Place fruit jars below the spouts of the boxes as before. Using your finger or a pencil make furrows across the soil in one box and up and down the soil in the other.

Fill two sprinklers with water and slowly sprinkle the two boxes at the same time. Hold the sprinklers the same height above the soil and pour at the same rate. Compare the rate of flow into the two jars and note the difference in their contents.

Another way to do this is to put mounds of soil in the middle of the boxes or in two large, round, low dishpans. With a pencil or your fingers make furrows up and down one of the mounds and circles around the other mound. Sprinkle an equal amount of water on each mound and observe the water. Remember though that such mounds probably have much steeper slopes than most cultivated land.

You can do this in the yard if you have a sloping area where there is no grass or where the grass is badly worn by walking or playing. By doing this outdoors, you can use a larger area. Make two plots 3 feet wide and 5 feet long with 1 or 2 feet between them.

With a regular garden hoe cut grooves 4 inches apart and about 2 inches deep across the slope on one plot and up and down the slope on the other. Notches cut in the edge of a 1- by 12-inch board (as shown in the drawing) can make the grooves.

Lay a perforated lawn-sprinkling hose between the two plots and turn it on so that a steady shower falls on both plots with equal intensity. Make careful notes of what happens on both plots.

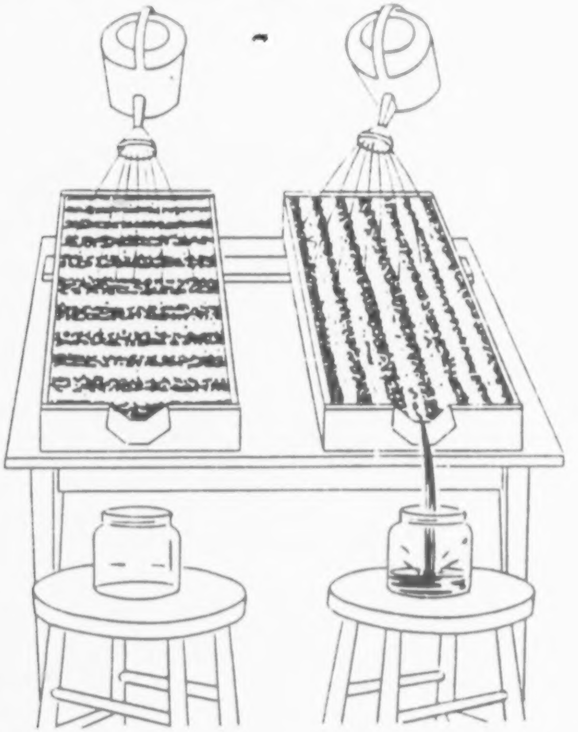
Interpretation

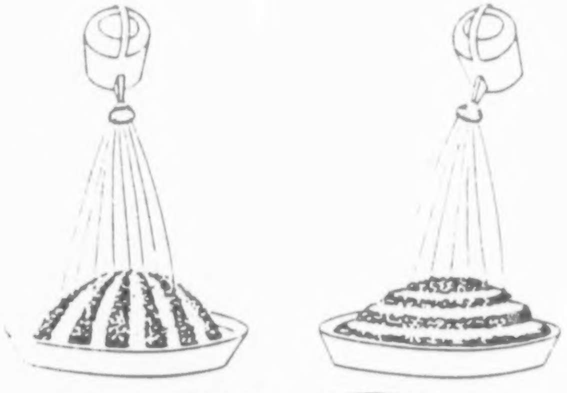
Contour farming is one of the easiest and most widely accepted conservation practices. It is the use of implements across the slope of the land; that is, on the contour. When a farmer farms on the contour he disregards the usual straight field boundaries and straight rows and follows curved lines whenever necessary to stay on the contour.

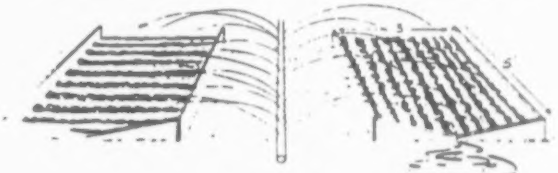
Contour farming should be used in combination with crop rotations, grass waterways, fertilizers and returning organic matter to the soil. Contouring alone will not stop erosion. But it reduces soil erosion as much as 50 percent on a wide range of soil and slope conditions. Steepness and length of slope are important, as well as the crop grown and the condition of the soil.

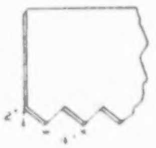
There are other advantages of contour farming. In low-rainfall areas it helps hold and conserve rainfall. Farmers have found that it saves power, time and wear on machinery because the equipment is working at peak efficiency all the time instead of being overloaded going uphill and underloaded coming downhill.

Cultivation on the contour helps prevent erosion and saves rainfall in gardens on sloping land.









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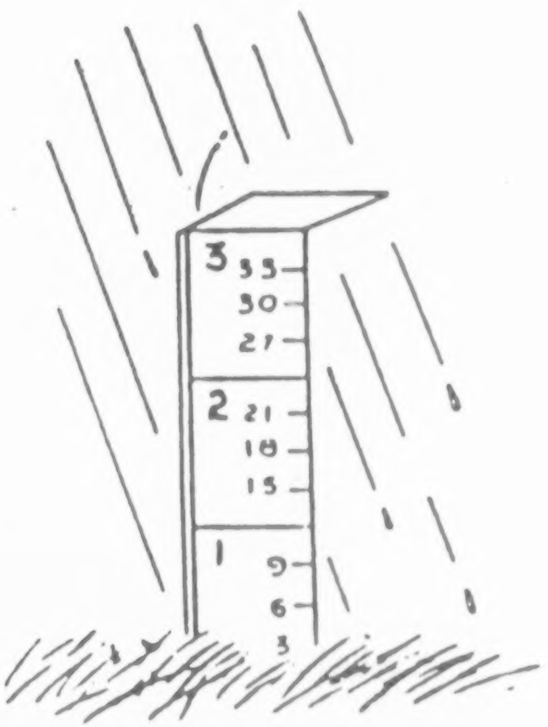
Make Splash Boards To Study Splash Erosion

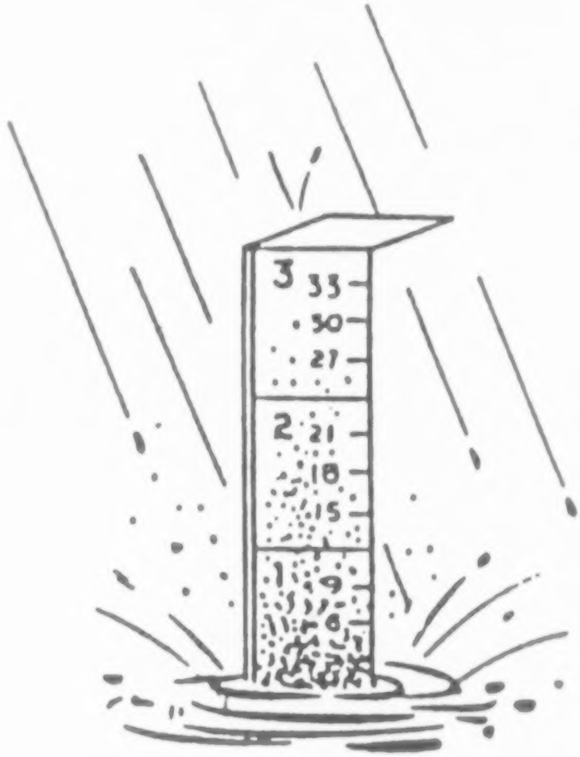
Get two boards 1 inch thick, 4 inches wide and 3½ feet long. Sharpen one end of each board. Paint them white. Mark lines across the boards at 1-foot intervals beginning at the unsharpened end. Attach tin shields about 4 inches wide and 8 to 10 inches long to the top of each board (see drawing). The shield helps prevent rain from washing off the splashed soil.

Locate two spots with very different amounts of grass cover. Some suggestions are:

1. A bare or nearly bare spot in the schoolyard where the grass is well trampled and an untrampled spot where the grass is heavy.
2. A spot on each side of a farm fence where the grass is heavy on one side and thin or the ground bare on the other side.
3. A field in a cultivated crop like small corn, cotton or vegetables and a meadow where a grass-legume crop is growing.

List the five categories of soil conservation reasons on the board and explain their meaning to your students. Then have your students categorize each of 15 statements on the activity sheet. Students can place the following abbreviations on the space before each statement: HUM for humanitarian reasons; ECON for economic; STEW for stewardship; ENV for environmental; and AES for aesthetic. It is possible that one reason may fit into more than one category. Ask your students to brainstorm other examples for each of the categories. Conclude this activity by asking the questions, "Why can soils be called one of our most valuable natural resources?" Clearly all of the reasons listed on the activity sheet and those brainstormed by your students answer the question.





Name ______________________

Why Conserve Soils?

Objectives

1. Students will tell why soils can be called one of our most valuable resources.
2. Students will categorize reasons for conserving soils as humanitarian, economic, stewardship, environmental or aesthetic.

Supplies Needed: none

The 15 words at the bottom of the page are hidden in the word puzzle and are used to fill in the blanks of the statements. Each of these statements is a reason we should conserve soils.

There are 15 words hidden in the puzzle. These words are listed below. Try to find as many as you can. You can circle them across, down and diagonally. The letters of each word are always in order. Then use the letter of the correct word to fill in the blank in these statements:

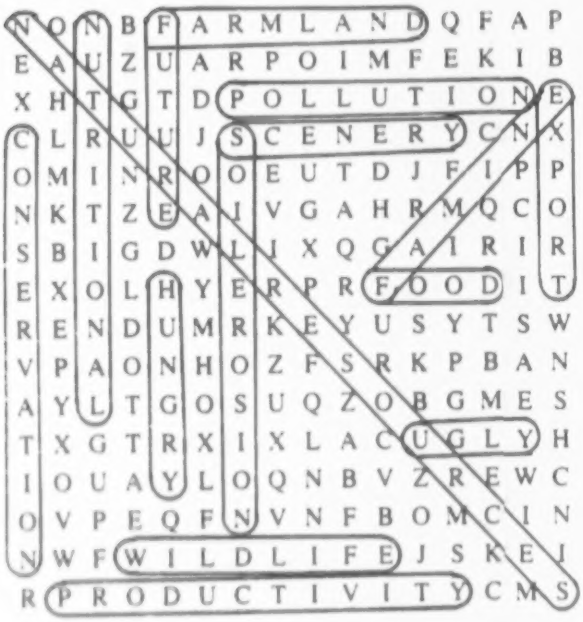
N	O	N	B	F	A	R	M	L	A	N	D	Q	F	A	P
E	A	U	Z	U	A	R	P	O	I	M	F	E	K	I	B
X	H	T	G	T	D	P	O	L	L	U	T	I	O	N	E
C	L	R	U	U	J	S	C	E	N	E	R	Y	C	N	X
O	M	I	N	R	O	O	E	U	T	D	J	F	I	P	P
N	K	T	Z	E	A	I	V	G	A	H	R	M	Q	C	O
S	B	I	G	D	W	L	I	X	Q	G	A	I	R	I	R
E	X	O	L	H	Y	E	R	P	R	F	O	O	D	I	T
R	E	N	D	U	M	R	K	E	Y	U	S	Y	T	S	W
V	P	A	O	N	H	O	Z	F	S	R	K	P	B	A	N
A	Y	L	T	G	O	S	U	Q	Z	O	B	G	M	E	S
T	X	G	T	R	X	I	X	L	A	C	U	G	L	Y	H
I	O	U	A	Y	L	O	Q	N	B	V	Z	R	E	W	C
O	V	P	E	Q	F	N	V	N	F	B	O	M	C	I	N
N	W	F	W	I	L	D	L	I	F	E	J	S	K	E	I
R	P	R	O	D	U	C	T	I	V	I	T	Y	C	M	S

1. Soils are one of our most valuable ______.
2. Severe soil erosion can lead to water ______.
3. Soil ______ must be kept high to produce all of the food we need.
4. People in many developing nations would be ______ without food aid from the U.S.
5. Prosperous, productive farms provide us with beautiful ______ as we travel along our nation's highways.
6. Windbreaks and other soil conservation practices create homes for birds, rabbits, foxes and other kinds of ______.
7. The ______ depends upon productive soils.
8. U.S. food aid helps meet the ______ needs of many people in developing nations.
9. More than 50 years after the Dust Bowl era, ______ is still a national challenge.
10. Soil erosion can increase the price of the ______ that we eat.
11. Mudslides, gullies and muddy water are ______ to look at.
12. Soil ______ is an important part of prosperous farming.
13. ______ occurs when there are severe food shortages in an area.
14. Every day, more and more ______ is lost to non-agricultural use.
15. Food is a major ______ that we sell to nations around the world.

a. conservation
b. export
c. famine
d. farmland
e. food
f. future
g. hungry
h. natural resources
i. nutritional
j. pollution
k. productivity
l. scenery
m. soil erosion
n. ugly
o. wildlife

Adapted from "Conserving Soils," USDA Soil Conservation Service.

Why Conserve Soils? — Key



N O N B F A R M L A N D Q F A P
E A U Z U A R P O I M F E K I B
X H T G T D P O L L U T I O N E
C L R U U J S C E N E R Y C N X
O M I N R O O E U T D J F I P P
N K T Z E A I V G A H R M Q C O
S B I G D W L I X Q G A I R I R
E X O L H Y E R P R F O O D I T
R E N D U M R K E Y U S Y T S W
V P A O N H O Z F S R K P B A N
A Y L T G O S U Q Z O B G M E S
T X G T R X I X L A C U G L Y H
I O U A Y L O Q N B V Z R E W C
O V P E Q F N V N F B O M C I N
N W F W I L D L I F E J S K E I
R P R O D U C T I V I T Y C M S

a. conservation
b. export
c. famine
d. farmland
e. food
f. future
g. hundry
h. natural resources
i. nutritional
j. pollution
k. productivity
l. scenery
m. soil erosion
n. ugly
o. wildlife

1. Soils are one of our most valuable h.
2. Sever soil erosion can lead to water j.
3. Soil k must be kept high to produce all of the food we need.
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5. Prosperous, productive farms provide us with beautiful l as we travel along our nation's highways.
6. Windbreaks and other soil conservation practices create homes for birds, rabbits foxes and other kinds of o.
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12. Soil a is an important part of prosperous farming.
13. c occurs when there are severe food shortages in an area.
14. Every day, more and more d is lost to non-agricultural use.
15. Food is a major b that we sell to nations around the world.

Objectives:

1. Students will conduct research on the Dust Bowl era.
2. Students will compose short stories about the impact of the Dust Bowl on the individual.

Supplies Needed: research materials

Begin by asking students to read the first paragraph of the activity sheet. Then have them brainstorm other ways that soil erosion affects us. List the answers on the board. Students should conclude that there are no benefits to soil erosion.

Next, your students should read the remaining part of the activity sheet. You can add any other information to emphasize the tragedy of the Dust Bowl. You could also read all or portions of the first chapter of John Steinbeck's book *The Grapes of Wrath*. This short chapter includes a realistic description of what the dust storms looked like. It also has a brief section on how the storms affected farmers.

To conclude the lesson, ask your students to conduct any research that they need to write a short story or other creative expression. Students could read books about the Dust Bowl era or read articles in magazines from that time. (Most large libraries keep back issues of periodicals in storage.) Students could also interview persons who lived then. Contact your local Soil Conservation Service for information on how the Dust Bowl could have been prevented. The short stories or other forms of creative expression should be written as if the student lived through the Dust Bowl.

You might also invite a person that lived during the Dust Bowl era to speak to your class. Or, as an alternative tape record an interview with that person. Such an experience would be an excellent culmination to this activity.

Soil Erosion: How It Affects Us

Soil erosion is an expensive national problem. Each of us pays for it in higher food bills and higher taxes. Eroded soils cannot grow as much food per acre. Silt and sediment must be dug more often from our harbors and rivers to clear the way for boat and ship traffic.

The Dust Bowl era is the best example of how erosion can affect people. The Dust Bowl occured during the 1930's in Texas, Kansas, Oklahoma, New Mexico, and Colorado. Drought and harsh winds created large dust storms. Eroded soil filled the skies. The sun looked blood-red through the gray haze. Farm equipment, houses, and roads were buried. Soil was blown so high into the air that it traveled as far away as Washington, D.C.

Read these facts about the Dust Bowl era.

1. The nation was in the Great Depression. Jobs were scarce and money was in short supply.
2. Tough prairie grasses were replaced with less drought-resistant crops of corn and wheat.
3. Many acres of rangeland were overgrazed and were left bare or with little cover crop.
4. A series of severe droughts occurred in 1931, '34, '36, and '37.
5. Millions of acres of corn and wheat withered and died on the Plains because of the drought.
6. Farmers could not make payments on loans. Many lost their homes and farms to banks and loan companies.
7. Huge dust storms eroded the soils. In some places from 2 inches to 1 foot of topsoil were lost.
8. Thousands of unemployed, poor farm families left the Dust Bowl area. Many of them headed for California. They often became migratory workers living in camps.
9. There was a sense of gloom, confusion, misery, and hopelessness among the many people who lived in the Dust Bowl.
10. The Dust Bowl was caused by a combination of three factors: the Great Depression, drought and poor agricultural practices.

How would you have felt living in the Dust Bowl era? Would your family have left? Where would you have gone? What would you have done?

Think about these questions, then write a short story or other creative expression about the Dust Bowl. It need not be long, just a few paragraphs will do. If you need help, use one of these sentences to get you started:

"Christmas of 1937 would have made Mr. Scrooge happy . . ."

"The porch swing banged behind me as I tried to escape the terrible heat of the long afternoon."

"As a rural mail carrier I hated the letters I had to deliver from banks to small farmers."

"No one answered my question: Would we have to leave Rex behind?"

"Pa kicked at the dry stubble – all that was left of a promising spring crop."

"We could have prevented the Dust Bowl if only we had . . ."

Adapted from "Conserving Soils," USDA Soil Conservation Service.

OUR CHILDREN'S FUTURE • PROTECT LITTLE TREES

Conservation Pledge

"I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country — its soil and minerals, its forests, waters and wildlife."

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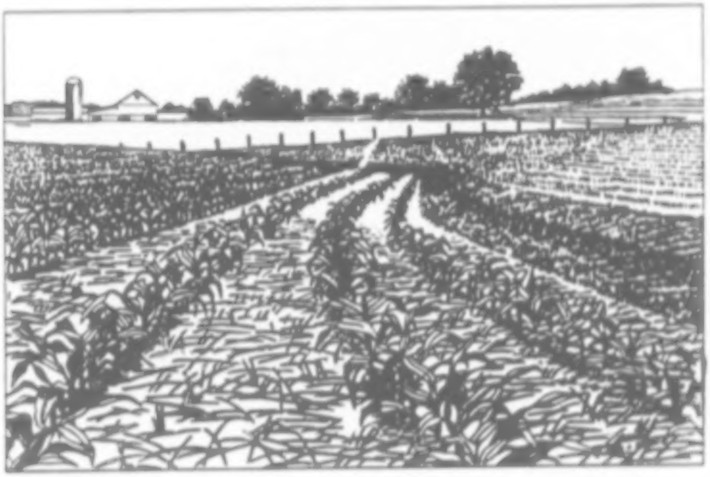
Name ______________________

Soil Conservation — What Have You Learned?

From the word bank below, place the letter of the answers which matches these statements. One of the statements has 2 or 3 correct answers.

______ 1. What zone of soil does best to sustain plant growth?
______ 2. One thing found in topsoil.
______ 3. The ability of soil to hold water.
______ 4. The measurement of acid or base in a soil.
______ 5. Can cause soil to erode.
______ 6. Can cause soil to be less productive.
______ 7. A government agency which assists the public in land management.
______ 8. Needs to realize the importance of natural resource conservation.
______ 9. Original source of soil.
______ 10. A practice which retards runoff.

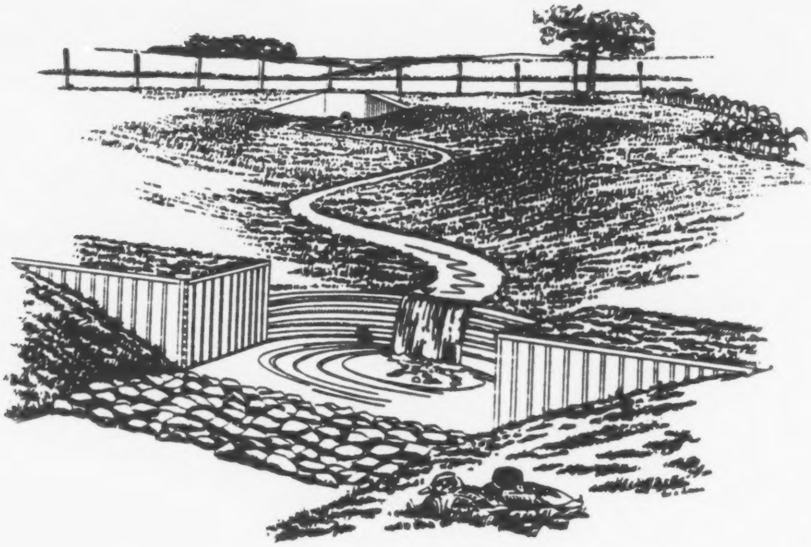
A. available nutrients
B. contouring
C. topsoil
D. parent material
E. waterholding capacity
F. everyone
G. wind
H. water
I. Soil Conservation Service.
J. Health and Welfare
K. poor management
L. pH
M. snow



SOIL CONSERVATION SERVICE
US DEPARTMENT OF AGRICULTURE

Soil Conservation Key — What Have You Learned?

1. C
2. A
3. E
4. L
5. G, H, K
6. K
7. I
8. F
9. D
10. B



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Agriculture and
Natural Resources
Unit 34

Land Use Planning

Background – Land Use Planning

Land use planning is any thought, logic, or planning that is applied to the use of a portion of the earth's surface. In 1852 the U.S. population was 23 million. There were 83 **acres** for each citizen. In 1977 there were only 8 acres for each person. The population pressure certainly has a large effect on how the land is used.

Ohio has 26 million acres of land area. About 50 percent is suitable for crop production. Ohio has seven large metropolitan areas, as well as hundreds of smaller towns, where much of the land is paved or covered with man-made buildings. As new construction occurs, valuable land is lost for crop production.

An interstate highway takes up 36 acres of land for every mile of road. Construction of roads often leaves some isolated and hard-to-farm parcels of land. Thus, it is important to plan the use of land wisely.

Land use planning is a method used by communities to designate what will be allowed to happen to the land. It involves the study of the local soils and **geology**, the area's history and the needs of the community.

Ohio has been surveyed using the Land Office Grid system and the Metes and Bound system. These systems are based on a grid pattern which is similar to **latitude** and **longitude** lines. Latitude and longitude lines are too difficult to use when subdividing the land surface on a local scale. **Townships** are 6 miles wide and are numbered east and west from an established Principal Meridian line. The resultant 6-mile by 6-mile block of land is called a township. Each township has 36 sections in it. A **section** is 1 mile by 1 mile square. The legal description of a plot of land will be defined by the surveyor's terms. An example would be NE 1/4, NW 1/4, Sec 19, T35, R2W. Written out this would translate to Northeast 1/4 Northwest 1/4 of Section 19, Township 35 and Range 2 West.

Land use planning is not a new concept. Communities all over the world have employed this technique. We could study examples in Europe, Asia, and the Mediterranean to understand it. People's basic needs of food, fiber, and shelter have dictated that they preserve the fertile soil for growing crops and build their homes and towns where the soil is poor.

In the United States we have an abundance of fertile soil and have not had to restrict the expansion of our communities. Many cities have planning and zoning departments in their governments which designate where commercial, industrial, and residential building may occur within their jurisdiction. They also consider the long term effects of the location of industrial developments in relation to residential areas and the effects on the health and welfare of the citizens. They also consider the long term effects of building to the health and welfare of the citizens.

One factor they consider is the possibility of a flood and another is the possibility of an earthquake. Geologists can help to determine the likelihood that damage from either one of these disasters will occur. Soil scientists can help in planning by identifying the most productive soil, which should be reserved for agriculture, and less productive soils which could be used to build homes and factories. The U.S. Geologic Survey and the Soil Conservation Service are government agencies which have information on soils and land use taken across the United States.

Lesson: **Land Use Planning**

Ag Unit: **Natural Resources**
Core
Major: **Social Studies**
Minor: Mathematics

Related Lesson Plans

Soils
Soil Conservation
What Are Natural Resources?

Remarks/Notes

Resources:

Empty cereal boxes; empty tissue boxes

Premise:

Land use planning is a process communities can use to improve organized development, protect productive land and guard against natural disasters.

Objectives:

Students will learn the terms used in legal descriptions of land. They will understand the need for land use planning. Students will be able to list five demands of the land.

Vocabulary:

1. Floodplain — level land adjacent to streams that may be subject to flooding
2. Geology — a study of the history of the earth and events recorded in rocks
3. Latitude — distance north and south from the equator measured in degrees
4. Longitude — distance east and west of the prime meridian, expressed in degrees or time
5. Range — a numbering system that defines north-south strips of land in a land survey
6. Section — a plot of land that is 1 mile × 1 mile square and consists of 640 square acres; one of the 36 subdivisions of a township
7. Seismograph — a recording instrument used to detect and measure the force of an earthquake
8. Township — a numbering system that defines east-west strips of land in a land survey; also used to identify the 6 × 6 mile block of land
9. Acre — 43,560 square feet

Trivia:

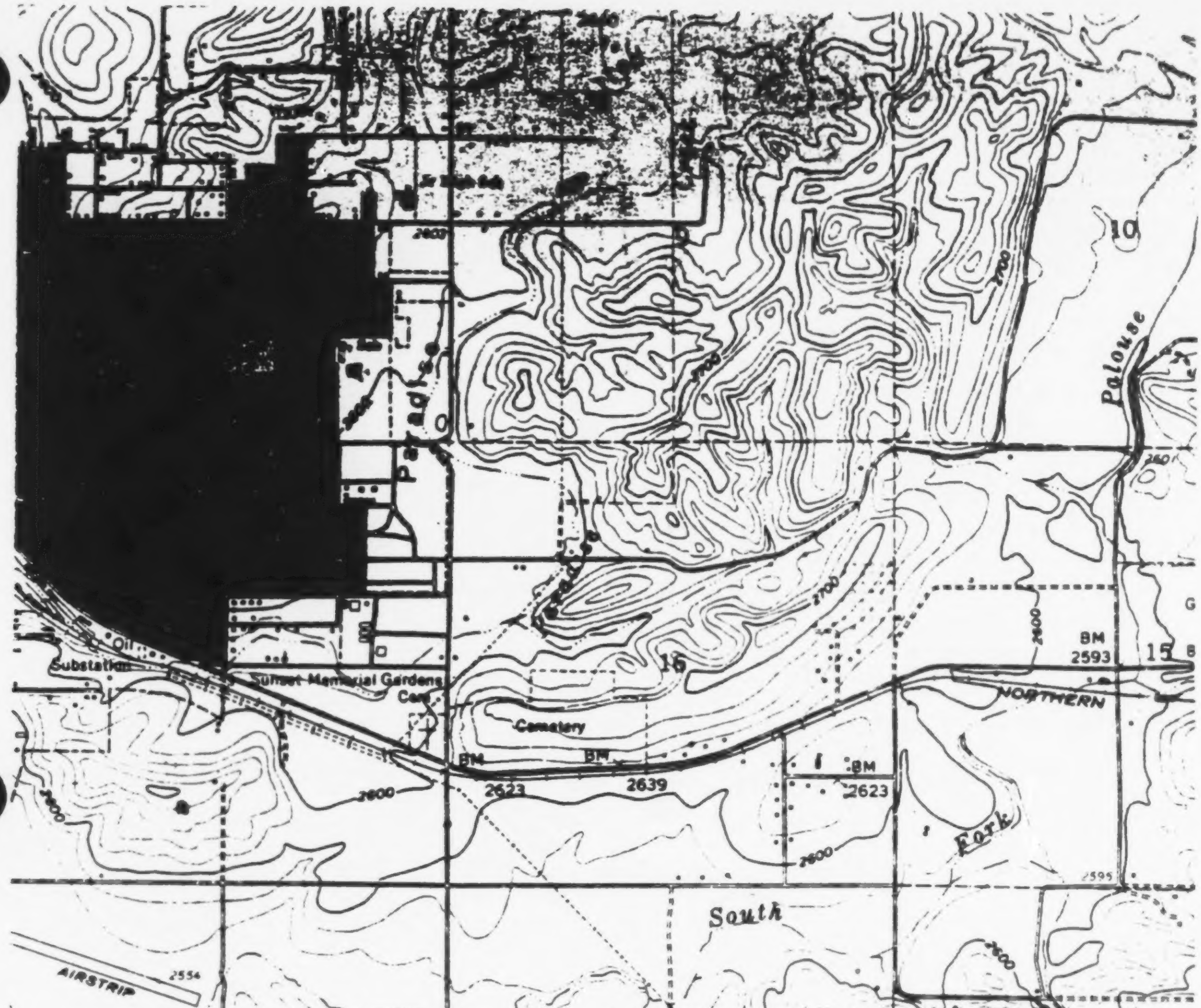
1. Ohio has a land area of just over 41,000 square miles.
2. Ohio is ranked 35th among the 50 states in size; however, Ohio is ranked 6th in the nation with a population of 11 million people.
3. Ohio is a very diverse state, from its rural countrysides to its urban development, and from Lake Erie on the northern border to the south border on the banks of the Ohio.
4. In 1800, land sold for $2.00 per acre, with a minimum purchase of 320 acres.

Trivia (continued)

5. An 1802 resolution by the Ohio Constitutional Convention, gave 1/36 of the land area of Ohio for the support of schools. Thus, each township reserved Section 16 for its school land whenever possible (see Grid, page 6).

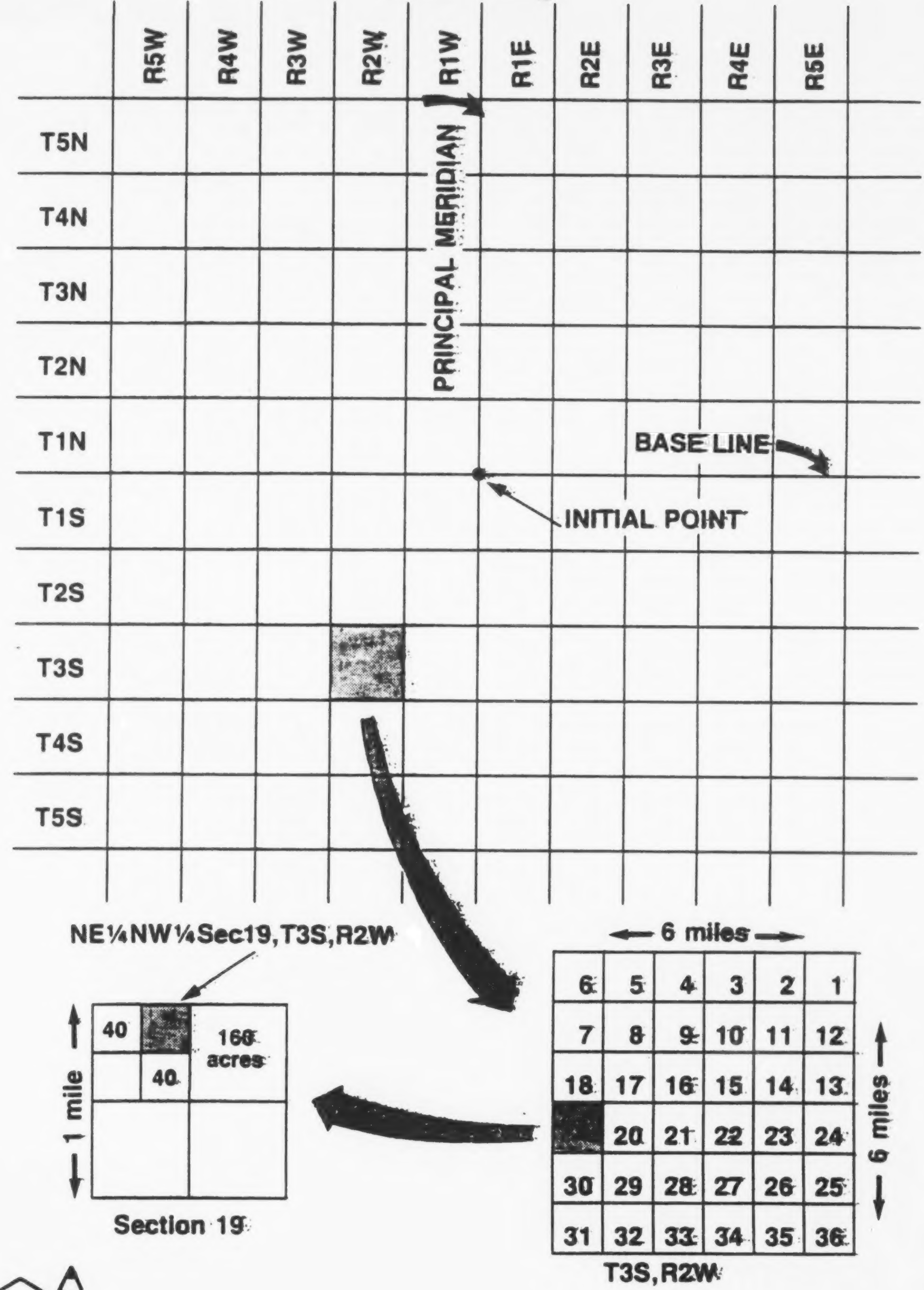
Suggested Activities:

1. **Landforms** — Ask for 12 student-volunteers to come up to the front of the classroom. Have two of the students put their hands together with their arms up to form a peak. Have two more students put their hands together and bend over at the waist to form a plateau. Ask four of the students to sit hunched over on the floor with their backs to the class. The remaining four students represent rivers and streams. Ask them to place themselves accordingly and stretch out. Using empty cereal and tissue boxes, ask the class where you should build a town and demonstrate the advantages/disadvantages of their selection. Ask for 12 more student-volunteers and repeat the activity.
2. Invite a speaker from the local Soil Conservation District, the U.S. Geologic Survey and/or the Planning and Zoning Department to come to class and discuss what he/she does and how it affects local land use planning or building.
3. **Topographic Map (1 or 2 class days)** — Secure topographic maps (see sample on page 5) for each student and yourself of your county. Using yours on a wall, have the students identify their town. Next call on a student at a time and have him/her name a location in the county and try to locate it on the map. Have him/her identify the surface features of the land according to the detail on the map.
4. **Relief Map (1 class week)** — Using either modeling clay, paper maché (homemade or commercial) or styrofoam and a piece of cardboard 1 foot × 1 foot, have the students design a section of land. They may have hills, rivers, floodplains, etc. in their design. Have them paint the relief map accordingly. Now have them create their perfect town on the model. Remind them to take into consideration any possible natural disasters in their plans. They should have residential, commercial, industrial and agricultural areas incorporated in their design. The students can use construction paper, cardboard, etc. for the structures. One common item should be used by all to represent the dump. Ask the students to make a presentation of their relief maps to the class and explain the advantages of their "perfect towns" according to good land use design.
5. **Math/Surveyor's Language** — Using the grid available (page 6), have the students select a section and then have the class give its legal description. Use the example to get started. Calculate how many acres are in a section, how many in NE¼NW¼Sec19,T3S,R2W and then convert those figures into feet. You may wish to take the students outside to walk off 200 to 500 feet so that they can get a feel of the size of the land plot a section represents.
6. Have students complete the worksheet "Growing Enough Food: Disappearing Farmland" on pages 7, 8 and 9.


10
Palouse
Paradise
Oil
Substation
Sunset Memorial Gardens
Cem
Cemetery
16
BM
2593
15
NORTHERN
BM
2623
BM
2639
BM
2623
Fork
South
AIRSTRIP
2554
2600
2700
20
21
22
2846
2800
2984
29
28
27

BEST COPY AVAILABLE

Grid Map


R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
T5N
T4N
T3N
T2N
T1N
T1S
T2S
T3S
T4S
T5S
PRINCIPAL MERIDIAN
BASE LINE
INITIAL POINT
NE¼NW¼Sec19,T3S,R2W
40
160 acres
40
1 mile
Section 19
6 miles
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
6 miles
T3S,R2W

Growing Enough Food: Disappearing Farmland

Objectives:

1. Students will recognize that the irreversible loss of farmland to other uses is a national concern.
2. Students will compare land use in their communities now and in the past.
3. Students will discuss the interrelationships between disappearing farmland and world food supplies.

Supplies needed: Reference materials

Have your students read this activity and select the correct answers. After they have finished, read the statements and provide them with the correct choices. Emphasize the connection between the ability to meet the world demand for food and the loss of farmland. Point out that if we continue to lose our farmland, the United States may not be able to help feed the additional two billion people expected in the world by the year 2000. What might some of the consequences be if we cannot grow extra food for export?

Investigate how farmland is being lost in your area. You can easily tell by comparing current aerial photographs, soil survey maps or land use maps with those that are 10, 20 or 30 years old. Older land use maps can be found in old books about the history of your county. The maps and photos show how people use land at different points in time: for agriculture, for homes, for shopping areas or for industry. By comparing the old and the new maps, you can tell how much land that was once used for farming is now used for something else.

Allow small groups of students to study the maps close up. Help them find their homes on current maps and that same area on older maps.

You could also have someone from your community come to your class and tell what the community was like 30 or 40 years ago.

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Name ______________________

Growing Enough Food: Disappearing Farmland

Fill in the blanks in the story from the list of words below. Each word is used only once. The sentence should give you enough clues to choose the right word.

Part 1

John Smith and his wife Dawn have been raising ____________ and ____________ on the farm for many years. Now they are having a difficult time making a ________________. Their property ________________ keep rising. The ________________ for farm machinery, fuel and supplies are also rising. But the Smiths do not get paid much more for their ________________. The Smiths are ________________ with farming.

At the same time, the ____________ are expanding. Home builders are hunting for more ____________. The land is needed to build ____________, ____________, ________________________ and ________________________.

A local ________________ made a good offer for their farm and the Smiths sold.

builder
businesses
costs
crops
discouraged
factories
harvest
houses
land
livestock
profit
roads
suburbs
taxes

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Growing Enough Food: Disappearing Farmland

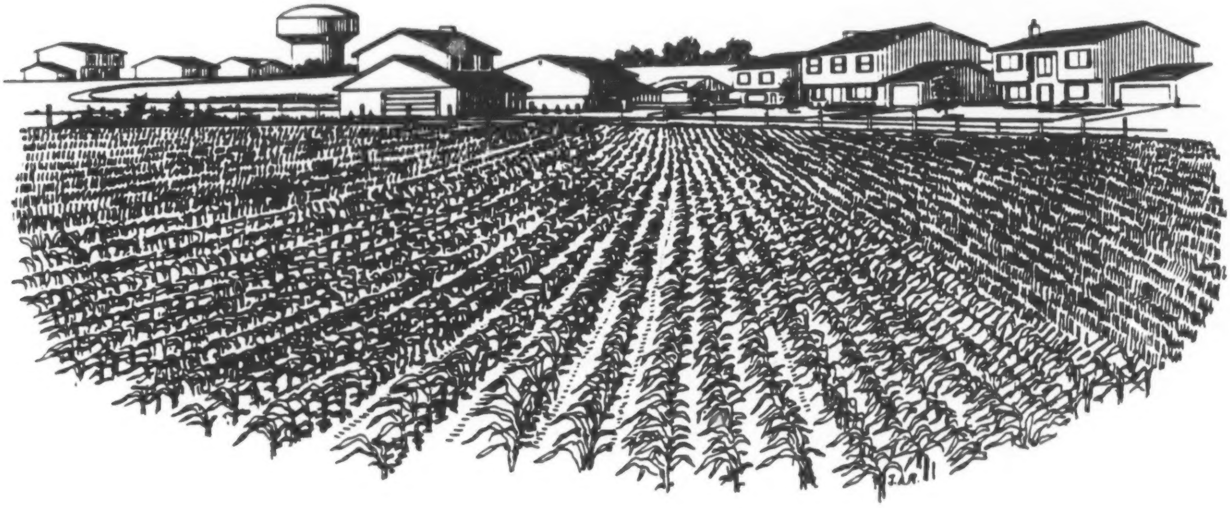
Part 2

Many other farmers face the same ______________ that the Smiths did. ______________ areas are being changed into cities and suburbs. Every year we lose about 675,000 ________ of cropland. We lose land to these competing uses: ______________, ______________ ______________ and ______________. These types of losses are ______________. The land can never be used again for ____________.

In addition we lose ________________ and ________________ each year. This may make ______________ and ______________ habitat scarce in the future.

We should not continue to ______________________ farmland this fast. It will be more difficult to grow enough ________________ for our use and for export.

acres
agriculture
airports
food
forests
irreversible
lose
lumber
mining
problems
reservoirs
rural
transportation
wetlands
wildlife



SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

Key — Growing Enough Food: Disappearing Farmland

Part 1

John Smith and his wife Dawn have been raising **crops** and **livestock** on the farm for many years. Now they are having a difficult time making a **profit**. Their property **taxes** keep rising. The **costs** for farm machinery, fuel and supplies are also rising. But the Smiths do not get paid much more for their **harvest**. The Smiths are **discouraged** with farming.

At the same time, the **suburbs** are expanding. Home builders are hunting for more **land**. The land is needed to build **houses**, **businesses**, **factories** and **roads**.

A local **builder** made a good offer for their farm and the Smiths sold.

Part 2

Many other farmers face the same **problems** that the Smiths did. **Rural** areas are being changed into cities and suburbs. Every year we lose about 675,000 **acres** of cropland. We lose land to these competing uses: **reservoirs**, **transportation**, **airports** and **mining**. These types of losses are **irreversible**. The land can never be used again for **agriculture**.

In addition we lose **forests** and **wetlands** each year. This may make **lumber** and **wildlife** habitat scarce in the future.

We should not continue to **lose** farmland this fast. It will be more difficult to grow enough **food** for our use and for export.

Name __________________

Land Use Planning — What Have You Learned?

Fill in the blanks:

1. The Soil Conservation Service evaluates ______________ and can tell you about a certain soil's ______________.
2. Some communities in Japan build houses on the sides of hills and leave the fertile, crop-producing land to ______________ food.
3. In the United States all the ______________ has been surveyed and subdivided in accordance with the U.S. Federal Rectangular Survey or the Land Office Grid System.
4. Latitude is a measurement which runs somewhat parallel with the earth's ______________
5. The U.S. Geologic Survey studies the earth's ______________ and history.
6. A floodplain is that area of land which may become ______________.
7. A legal description of land uses references to townships, ranges and ______________.

cities
dirt
limitations
equator
flooded
grids
grow
hills
land
pole
sections
soil
surface
water
west

Land Use Planning Key — What Have You Learned?

1. The Soil Conservation Service evaluates soil and can tell you about a certain soil's limitations.
2. Some communities in Japan build houses on the sides of hills and leave the fertile, crop-producing land to **grow** food.
3. In the United States all the **land** has been surveyed and subdivided in accordance with the U.S. Federal Rectangular Survey or the Land Office Grid System.
4. Latitude is a measurement which runs somewhat parallel with the earth's **equator**.
5. The U.S. Geologic Survey studies the earth's **surface** and history.
6. A floodplain is that area of land which may become **flooded**.
7. A legal description of land uses references to townships, ranges and **sections**.

Information Sources

- 1990 Directory of Agriculture
- Teaching Materials Available through Ohio Sources

1990 Directory of Agriculture

(courtesy of *The Ohio Farmer* magazine)

FARM ORGANIZATIONS

Agricultural Forum
Acting dir., ag industry
2120 Fyffe Road
Columbus 43210
(614) 292-4077

All Ohio Chapter Soil & Water Cons. Society
Dan Ross, president
412 Springdale Road
Stow 44224|L
(216) 929-2871

Computing Farmers of Ohio
Larry Daniels
P.O. Box 378
Smithville 44677
(216) 669-2134

Farm & Power Equip. Dealers Assn.
David Kahler, exec. vp/CEO
6124 Avery Road, Box 68
Dublin 43017
(614) 889-1309

Farm Credit Bank of Louisville
Steven J. Montgomery
pres./CEO
P.O. Box 32660
Louisville, KY 40232
(502) 566-7150

Farm Focus
Jon Peacock, Ext. agent
1055 S. Washington
Van Wert 45891
(419) 238-1214

Farm Markets of Ohio
Ron Miller, mgr.
P.O. Box 479
Columbus 43216
(614) 249-2430

Farm Science Review
Craig Fendrick, gen. mgr.
590 Woody Hayes Drive
Rm. 232
Columbus 43210
(614) 292-4278

Fruit Growers Marketing Assn.
Dave Gress, gen. mgr.
P.O. Box 70
Newcomerstown 43832
(614) 498-8366

Future Homemakers of America Ohio Assn.
Adel Riegel, state adv.
65 S. Front St., Rm. 912
Columbus 43215
(614) 644-6838

Independent Livestock Marketing Assn.
Paul Juday, exec. sec.
Rt. 3, Box 419
Elwood, IN 46036
(317) 552-3939

International 4-H Youth Exchange Programs
Mary Lynn Thalheimer
Int'l Program Assistant
2120 Fyffe Road
Columbus 43210-1084
(614) 292-6941

Int'l Society of Arboriculture Ohio Chapter
Joanne Kick-Raack
exec. dir.
P.O. Box 324
Pataskala 43062
(614) 927-5964

National Forest Products Assn.
David Collins, dist. mgr.
810 Plum St.
Cincinnati 45202
(513) 621-7298

Ohio Farm Alliance
Farm Credit hotline
(614) 448-4801
Keith Wiens, exec. dir.
13171 Concord Church Road
Glouster 45732
(614) 448-4801

National Water Well Assn.
Jay Lehr, exec. dir.
6375 Riverside Dr.
Dublin 43017
(614) 761-1711

Ohio Agriculture Awareness Council
John Davis
910 OH Depts. Bldg.
65 S. Front St.
Columbus 43266-0308
(614) 466-3076

Ohio Agricultural Council
Mark List, sec.-treas.
2663 Scott Court
Grove City 43123-2136
(614) 875-2482

Ohio Agricultural Hall of Fame
Mark R. List, sec.-treas.
2663 Scott Court
Grove City 43123-2136
(614) 875-2482

Ohio Agricultural Marketing Assn.
Paul Slade, gen. mgr.
Two Nationwide Plaza
P.O. Box 479
Columbus 43216
(614-249-2421

Ohio Apple Marketing Program
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3622 Middleton Road
Columbiana 44408
(216) 482-2924

Ohio Assn. Meat Processors Inc.
Ruth Wilson, exec. sec.
7601 U.S. 23 North
Delaware 43015
(614) 726-2369

Ohio Auctioneers Assn.
Marty Nelson
17 S. High St., Suite 1200
Columbus 43215
(614) 221-1900

Ohio Bankers Assn.
Ralph E. Bolen, exec. vp
17 S. High St., Suite 670
Columbus 43215
(614) 221-5121

Ohio Christmas Tree Growers
Rick Carlton, pres.
4708 Buhl Blvd.
Uniontown 44685
(216) 896-4262

Ohio Corn Growers Assn.
Michael Wagner, exec. dir
1100 E. Center St.
Marion 43302
(614) 383-2676

Ohio Corn Marketing Prog.
Michael Wagner, exec. dir.
1100 E. Center St.
Marion 43302
(614) 382-0483

Ohio Council of Churches
Carlton Weber, exec. dir.
89 E. Wilson Bridge Road
Worthington 43085
(614) 885-9590

Ohio Council of Farmer Cooperatives
2120 Fyffe Road
Columbus 43210
(614) 292-4077
Thomas McNutt, exec. coord.
(614) 876-4636

Ohio Dairy Products Assn.
Donald Buckley
exec. vp & sec.
1429 King Ave.
Columbus 43212
(614) 486-6000

Ohio Ecological Food & Farm Assn.
65 Plymouth St.
Plymouth 44865
(419) 687-7665

Ohio Equip. Distributors
David Kahler, exec. sec.
6124 Avery Road, Box 68
Dublin 43017
(614) 889-1309

Ohio Expositions Center Ohio State Fair
Jack Foust, gen. mgr.
632 E. 11th Ave.
Columbus 43221-2698
(614) 644-FAIR

Ohio Extension Homemakers Council
Jo Jones, adv.
1787 Neil Ave.
135 Campbell Hall
Columbus 43210
(614) 292-4481

Ohio Fair Managers Assn.
Mark R. List, exec. sec.
2663 Scott Court
Grove City 43123-2136
(614) 875-2482

Ohio Farm & Home Safety Committee
Thomas L. Bean, sec.-treas.
590 Woody Hayes Dr.
Columbus 43210
(614) 292-9455

Ohio Farm & Rural Vacation Assn.
Patty McNutt, sec.-treas.
6120 Cutler Lake Road
Blue Rock 43720
(614) 674-4555

Ohio Farm Bureau Federation
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Columbus 43216
(614) 249-2401

Ohio Farmers Union
Charlie Nash, pres.
1011 N. Defiance
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Ottawa 45875
(419) 523-5300

Ohio Federation of SWCD
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Fountain Square
Columbus 43224
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Ohio Fertilizer & Pesticide Assn.
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Worthington 43085
(614) 885-1067

Ohio FFA Assn.
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65 S. Front St.
Columbus 43266-0308
(614) 466-3076

Ohio Florists' Assn.
Harry Tayama, exec. dir.
700 Ackerman Road
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Columbus 43202
(614) 267-1117

Ohio Forestry Assn.
Ronald Cornell, dir.
1301 Worthington
Woods Blvd.
Worthington 43085
(614) 846-9456

Ohio 4-H Foundation
Don Schriver, pres.
2120 Fyffe Road
Columbus 43210
(614) 292-4444

Ohio 4-H Office
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2120 Fyffe Road
Columbus 43210-1084
(614) 292-6996

Ohio Fruit Growers Society
P.O. Box 479
Columbus 43216
(614) 249-2424

Ohio Grain & Feed Assn.
John Foltz, exec. dir
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Worthington 43085
(614) 885-4429

Ohio Grape Industries Program
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6877 N. High St., Suite 104
Worthington 43085
(614) 885-3529

Ohio Greenhouse Cooperative Assn.
Joan Stemmer, sec.
430 Bagley Road
Berea 44017
(216) 243-5600

Ohio Health Council
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Columbus 43210
(614) 292-4481

Ohio Home Economics Assn.
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Columbus 43210-1295
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Ohio Horticulture Council
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Ohio Junior Horticulture Assn.
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Ohio Land Improvement Contractors Assn.
Larry Trask, exec. sec.
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Dublin 43017
(614) 889-2314

Ohio Lumberman's Assn.
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Ohio Maple Producer's Assn.
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Ohio Meat Industries Assn.
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Waldo 43356-0316
(614) 726-2369

Ohio Mining & Reclamation Assn.
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(614) 228-6336

Ohio National Farmers Organization
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Anna 45302
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Ohio Nurserymen's Assn.
William P. Statler, exec. dir.
2021 E. Dublin-Granville Road
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(614) 431-2452
(614) 431-8032 (fax)

Ohio Nut Growers Assn.
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Massillon 44646
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Ohio Potato Growers Assn.
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Columbus 43214
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Ohio Rural Electric Cooperatives
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Columbus 43226-0036
(614) 846-5757

Ohio Seed Dealers' Assn.
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Ohio Soil & Water Conservation Commission
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Ohio Soybean Assn.
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Ohio State Grange
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Ohio State Tractor Pullers Assn.
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Ohio Swiss Cheese Assn.
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Sugarcreek 44681
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Ohio Township Assn.
Michael H. Cochran
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Ohio Valley Section Institute of Food Technology
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Ohio Veterinary Medical Assn.
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Ohio Water Well Assn.
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Caledonia 43314
(419) 845-2023

Ohio Wine Producers Assn.
Donniella Winchell
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(216) 466-4417
(800) 227-6972 (in Ohio)

Ohio Young Farmers & Farm Wives
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Power Show Ohio
David Kahler, dir.
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Water Management Assn. of Ohio
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(614) 424-6106

Women for Ohio Agriculture
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Beef (state)

Buckeye Beef Improvement Assn.
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Buckeye Polled Hereford Assn.
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Xenia 45385
(513) 376-1633

Eastern States Salers Assn.
Christina Ward, sec.
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Jerusalem 43747
(614) 472-0364

Ohio Angus Assn.
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sec.-treas.
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Ostrander 43061
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Stryker 43557
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Bradford 45308
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Urbana 43078

Ohio Hereford Assn.
Wayne Kiesewetter
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Piqua 45356
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Ohio Mid-Eastern Maine Anjou Assn.
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New Paris 45347
(513) 437-4653

Ohio Murray Grey Assn.
Mary Ellen Wozny, sec.
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Coolville 45723
(614) 667-6191

Ohio Santa Gertrudis Assn.
Walter Howdyshell, sec.
144 Highland Drive
New Lexington 43764
(614) 342-3582

Ohio Simmental Assn.
Janet Roberts, sec.
6910 Glenwood Road
Cumberland 43732
(614) 638-4321

Ohio Shorthorn Breeders Assn.
Don Ulry, sec.
8800 Johnstown-Utica Road
Johnstown 43031
(614) 967-8967

Ohio Red Poll Assn.
Jane Thompson, sec.
5520 W. SR 571
West Milton 45383
(513) 698-6166

Ohio Valley Gelbvieh Assn.
Shirley Colaiacovo, sec.
Rt. 1 TR 422, Box 403
Bolivar 44612
(216) 874-2243

Beef (national)

American Angus Assn.
3201 Frederick Blvd.
St. Joseph, MO 64506
(816) 233-3101

American Beefalo World Registry
116 Executive Park
Louisville, KY 40207
(502) 897-1650

American International Charolais Assn.
11700 N.W. Plaza Circle
P.O. Box 20247
Kansas City, MO 64195
(816) 464-5977

American Chianina Assn.
P.O. Box 890
Platte City, MO 64079
(816) 431-2808

American Gelbvieh Assn.
5001 National
Western Dr.
Denver, CO 80216
(303) 296-9257

American Hereford Assn.
1501 Wyandotte
P.O. Box 014059
Kansas City, MO 64101
(816) 842-3757

American Maine-Anjou Assn.
528 Livestock
Exchange Bldg.
Kansas City, MO 64102
(816) 474-9555

American Murray Grey Assn.
1222 N. 27th, Suite 208
P.O. Box 30085
Billings, MT 59101
(406) 248-1266

American Polled Hereford Assn.
Ernie Smith
7277 Azalea Road
Bowerston, OH 44695
(614) 269-0715

American Red Poll Assn.
P.O. Box 35519
Louisville, KY 40232
(502) 635-6540

American Salers Assn.
5600 S. Quebec 3220 A
Englewood, CO 80111

American Shorthorn Assn.
8288 Hascall St.
Omaha, NE 68124
(402) 393-7200

American Simmental Assn.
One Simmental Way
Bozeman, MT 59714
(406) 587-4531

North American Limousin Foundation
P.O. Box 4467
Englewood, CO 80166
(303) 220-1693

Red Angus Assn. of America
4201 I 35 North
Denton, TX 76201
(817) 387-3502
(817) 383-4036 (fax)

Santa Gertrudis Breeders International
P.O. Box 1257
Kingsville, TX 78364
(512) 592-9357

Dairy (state)

Buckeye Dairy Boosters
Georgianna Ogden, pres.
6226 Ogden Road
West Salem 44287
(216) 264-7499

DHI Cooperative Inc.
Stuart Johnson, gen. mgr.
9550 Liberty Road, Box 1560
Powell 43065-0505
(800) DHI-OHIO (344-6446)

Mid East UDIA
American Dairy Assn.
Dairy & Nutrition Council - Mid East
Scott Higgins, gen. mgr.
3592 Corporate Drive
Suite 114
Columbus 43231
(614) 890-1800

Ohio Ayrshire Breeders
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P.O. Box 118
Columbus 43266-0118
(614) 466-9283

Veterinary Services
William F. Nape
area vet. in charge
155 E. Columbus St.
P.O. Box 264
Pickerington 43147
(614) 469-5602

Farmers Home Administration

Allen L. Turnbull
state dir.
507 Federal Bldg.
200 N. High St.
Columbus 43215
(614) 469-5606

Federal Crop Insurance Corp.

Jo Sutter
5969 Lakeside Blvd., Suite B
Indianapolis, IN 46278
(317) 2990-3050

Federal Milk Marketing Administration

C. Mack Endsley
adm., Order 33
P.O. Box 29226
Columbus 43229
(614) 891-1851

C. Mack Endsley
adm., Order 36
P.O. Box 30128
Cleveland 44130
(216) 826-3220

Inspector General

James Barkley, supvr.
USDA office of inspector
general, audit
346 Federal Bldg.
200 N. High St.
Columbus 43215
(614) 469-6747

William Gerlach, supvr.
USDA office of inspector
general, investigations
350 Federal Bldg.
200 N. High St.
Columbus 43215
(614) 469-6737

Ohio Agricultural Statistics Service

James Ramey
ag statistician in charge
608 Federal Bldg.
200 N. High St.
Columbus 43215
(614) 469-5590

Soil Conservation Service

Joseph C. Branco
state conservationist
200 N. High St., Rm. 522
Columbus 43215
(614) 469-6962

Roger A. Hansen
deputy state consv.
for water resources
(614) 469-6962

Daniel L. Conrad
asst. state consv.
for programs
(614) 469-6962

state consv. engineer
(614) 469-6942

Melvin S. Skiles
state resource consv.
(614) 469-6890

K. Keith Huffman
state soil scientist
(614) 469-6914

Robert L. Burris
water resources planning
(614) 469-6932

Michell A. Lohstroh
public affairs spec.
(614) 469-5987

Area 1, Findlay
Thomas C. Sommer
area consv.
952 Lima Ave., Box E
Findlay 45840
(419) 422-8347

Area 2, Medina
Robert E. Ball
area consv.
143 W. Liberty St.
Medina 44256
(216) 725-4176

Area 3, Coshocton
James L. Piper
area consv.
9 Colonial Square
Fairy Falls Drive
Coshocton 43812
(614) 622-2930

Area 4, Dayton
Wayne Maresch
area consv.
2288 Grange Hall Road
Building H
Beavercreek 45431

Area 5, Chillicothe
David A. Coulter
area consv.
1534-3 N. Bridge St.
Chillicothe 45601
(614) 773-4090

Agricultural Education Service

John H. Davis, dir.
65 S. Front St.
Columbus 43266-0308
(614) 466-3076

Farm Business Planning
& Analysis Program
Larry Daniels
state supervisor
910 Ohio Depts. Bldg.
65 S. Front St.
Columbus 43226-0308
(614) 466-3076

Ag in the Classroom

Judy Roush, dir.
65 S. Front St.
Columbus 43266-0308
(614) 466-3076

Agricultural Technical Institute

Dan Garrison, dir.
Wooster 44691
(216) 264-3911

2120 Fyffe Road
Columbus 43210
(614) 292-7115

Columbus State Community College

550 E. Spring St.
Columbus 43216
(614) 227-2473

Clark State Community College

Dean Kite, dept. chair.
P.O. Box 570
Springfield 45501
(800) 282-4636

Cincinnati Technical College

3520 Central Parkway
Cincinnati 45223
(513) 569-1644

Hocking Technical Institute

Russ Tippett
Nelsonville 45764
(614) 753-3591

Muskingum Area Technical College

1555 Neward Road
Zanesville 43701
(614) 454-2501

Northwest Technical College

22-600 SR 34-R-1
Box 246-A
Archbold 43502
(419) 267-5511

Owens Technical College

Oregon Road
Toledo 43699
(419) 666-0580

Shawnee State Community College

940 Second St.
Portsmouth 45662
(614) 354-3205

University of Cincinnati

231 Bethesda Ave.
M.L. 13571
Cincinnati 45267
(513) 558-5171

Wilmington College of Agriculture

Monte Anderson
agriculture department
Wilmington 45277
(513) 382-6661

OSU College of Agriculture

100 Ag. Adm. Bldg.
2120 Fyffe Road
Columbus 43210
(614) 292-6891

Ohio Cooperative Extension Service

Bobby Moser, dir.
3 Ag. Adm. Bldg.
2120 Fyffe Road
Columbus 43210
(614) 292-6181

STATE GOVERNMENT TOLL-FREE LINES

Agriculture
(800) 282-1955
Attorney general's office
public action line
(800) 282-0515

Black lung information
(800) 282-0383

Bureau of
employment services
women's service div.
(800) 282-3525

Business development
(800) 282-1085

Cancer information service
(800) 422-6237

Consumer's counsel
(utility questions)
(800) 282-9448

Energy resources
development
(800) 292-9234

Energy credits program
(800) 282-4310

Environmental
Protection Agency
(EPA)
(800) 282-0270

HEAP hotline
(Home Energy
Assistance Program)
(800) 282-0880

Info-Ohio
(special events)
(800) 282-5393

Insurance
(800) 282-4658

Lawyer referral service
(800) 282-6500

Legislation
(800) 282-0253

Medicare
information service
(800) 282-0530

Migrant
(800) 282-3525

Nursing home hotline
(800) 282-1206

PAAD hotline
(drug/alcohol abuse)
(800) 282-9254

"Pinch the
poacher" hotline
(800) 762-2437

Public utilities commission
(800) 282-0198

Public welfare
(800) 282-1190

Rehabilitation
services commission
(800) 282-4536

Safety and hygiene
(employee complaints)
(800) 282-3045

Taxation
(800) 282-1780

Women's information
center
(800) 282-3040

TRADE ASSOCIATIONS

(Washington office)

**Agriculture Council
of America**
1250 I St., N.W., Suite 01
Washington, D.C. 20005
(202) 682-9200

**American Farm
Bureau Federation**
600 Maryland Ave., S.W.
Suite 800
Washington, D.C. 20024
(202) 484-2222

Animal Health Institute
119 Oronoco St.
Box 1417-D50
Alexandria, VA 22313
(703) 684-0011

**Chamber of Commerce
of the United States**
1615 H St., N.W.
Washington, D.C. 20062
(202) 659-6000

Food Marketing Institute
1750 K St., N.W., Suite 700
Washington, D.C. 20006
(202) 452-8444

Future Farmers of America
P.O. Box 15160
Alexandria, VA 22309
(703) 360-3600

**International Apple
Institute**
P.O. Box 1137
McLean, VA 22101
(703) 442-8850

National 4-H Council
7100 Connecticut Ave.
Chevy Chase, MD 20815
(301) 961-2800

**National Grain
and Feed Assn.**
500 Folger Bldg.
725 15th St., N.W.
Washington, D.C. 20005
(202) 783-2024

National Grange
1616 H St., N.W.
Washington, D.C. 20006
(202) 628-3507

TEACHING MATERIALS AVAILABLE THROUGH OHIO SOURCES

In addition to the teacher material available nationally found in the "Resource Guide to Educational Materials About Agriculture", we have compiled the following list of materials through Ohio sources. This is not a comprehensive list, and it is suggested that a good source of teaching materials is often in your own community.

Most materials are priced without postage and shipping costs. Check with individual sources before sending your order.

The following materials are available from:

Ohio Agricultural Education Curriculum
Materials Service
254 Ag. Adm. Bldg., OSU
2120 Fyffe Road
Columbus, Ohio 43210-1099

FARM & FOOD BYTES, ANIMAL AGRICULTURE - $39

Grade level: 4-6

Format:
Computer program for Apple or IBM, workbook, teacher's guide and documentation on specific livestock industries.
Description:
Basic skill activities in language arts, math, science, and social studies with animal information. Covers common animal terms, why animals are raised, why food from animals is nutritious.

FARM & FOOD BYTES, INTRODUCTION TO AGRICULTURE - $34

Grade Level: 4-6

Format:
Computer program for Apple or IBM, workbook, teacher's guide of 20 pages. (1987)
Description:
Includes activities dealing with language arts, science, math and social studies with an agricultural flavor. Also, includes menu-driven lessons and simulation games. Ohio version includes map activity.

FARM & FOOD BYTES, SOIL & WATER CONSERVATION - $34

Grade Level: 6-8

Format:
Computer program for Apple or IBM including workbook, teacher's guide, program disk and water cycle chart. (1986)
Description:
Includes activities to enhance math, science, social studies and language arts with conservation practices and ground water quality discussed.

SOIL CONSERVATION SOCIETY OF AMERICA - SINGLE COPY ($.75); 2 OR MORE COPIES ($.25 EA.); TEACHER GUIDE ($2.00/*$.50)

Grade Level: 4th and up

Format:
Cartoon Booklets with teacher's guides. Each booklet is 16 pages, full color on newsprint.
Description:
Booklets discuss importance of natural resources to life and impact humans have on environment.
Dracons Visit Earth: To study food and the land
The Story of Land: Its use and misuse through the centuries*
Plants: Improving Our Environment
Make room for monsters...and Wildlife on the land*
Water: The Basis of Life*
Robots of Cave Alpha: Creating a livable land

Ohio Ag In The Classroom
910 Ohio Departments Building
65 South Front Street
Columbus, Ohio 43266-0308
(614)466-3076

MEET THE MARVELOUS COW - FREE LOAN

Grade Level: 3-6

Format:
Video, 11 minutes (1989)
Description:
Introduces students to the dairy cow, her stages of development and her requirements for milk production. Developed by Wisconsin Milk Marketing Board.

WHERE MILK COMES FROM - FREE LOAN

Grade Level: K-2

Format:
Video, 15 minute
Description:
A teaching computer tells the audience about milk and milk products and how milk is distributed.

Ohio Department of Natural Resources
Division of Geological Survey
4383 Fountain Square Drive, Bldg. B
Columbus, Ohio 43224

First five free items are mailed at no charge. For each additional five free items (or fraction there of) please include $.25 for postage and handling. For cost items, please add 15% for postage and handling.

ROCK & MINERAL SET - 1 SET PER CLASS/FREE

Grade Level: Teacher Reference

Format:
A collection of small specimens of ten of Ohio's rocks and minerals.
Description:
Information sheet describes occurrences and uses, also includes small geologic map of the state.

OHIO'S GLACIERS - FREE/1 PER TEACHER

Grade Level: Teacher Reference

Format:
8 1/2" x 11" glacial map, other color photographs and educational leaflet.
Description:
Discussion of the Ice Age in Ohio, including glacial advances, glacial deposits, and Pleistocene life.

POSTER SERIES NO. 1 & 2 - $2.50 EA.

Grade Level: Teacher Reference

Format:
Sets of 26 posters, each measuring 8 1/2 x 14 inches, and including brief text on topics relating to Ohio geology.
Description:
Series 1 = gold in Ohio, coal, salt, meteorites, the Ice Age in Ohio, and caves. Series 2 = Ohio diamonds, charcoal iron furnaces, gypsum, grades, petroleum, natural bridges, and sandstone.

FLINT, OHIO'S OFFICIAL GEMSTONE - SINGLE COPIES FREE

Grade Level: Teacher Reference

Format:
Educational Leaflet.
Description:
Brief discussion of the occurrence and history of flint in Ohio.

American Sheep Industry Association
Dept. P589, 6911 S. Yosemite Street
Englewood, Colorado 80112
(303)771-3500

WOOL GRADES & THE SHEEP THAT GROW THE WOOL - $.50

Grade Level: Teacher Reference

Format:
Color brochure opens into a poster.
Description:
Describes the wool grading system and includes data and drawings of the most common American sheep breeds.

FLEECE TO FABRIC SWATCH CHART - $.50

Grade Level: Teacher Reference

Format:
8 1/2" x 11"
Description:
Actual samples of wool at various stages of processing into fabric.

WOOL - FREE

Grade Level: Teacher Reference

Format:
Foldout brochure
Description:
Facts about history, the chemical and physical makeup of the fiber, wool's natural qualities, care of wool and wool processing.

TASTE SAMPLING KITS - FREE

Grade Level: Teacher Reference

Format:
Folder of information
Description:
Includes instructions for a demonstration, lamb glossary, nutrition facts and recipe.

LAMB PROMOTIONAL ITEMS - AS NOTED IN DESCRIPTION

Grade Level: Teacher Reference

Format:
Variety of items promoting lamb and wool.
Description:
250 Balloons--in assorted colors, half lamb and half wool logos $20--1,000 lamb logo labels--"Fresh American Lamb" 1 Roll Free

Mid East United Dairy Industry Association
3592 Corporate Drive, Suite 114
Columbus, Ohio 43231
(614)890-1800

DAIRY PROMOTION - AS INDICATED IN DESCRIPTION

Grade Level: K-5

Format:
Variety of items designed to promote real dairy products.
Description:
"Milk, America's Health Kick" Pencils (.08 ea); Colorful Cow Erasers (.16 ea); Color Posters of Dairy Products (.90 ea); Crossword Puzzle Sheet (no charge for original, copying permitted) Word Scramble Sheet - grades 5 and up - (no charge for original, copying permitted)

THE MILK STORY - $.10

Grade Level: 1-8

Format:
Coloring Book, 15 pages
Description:
Simple description of how we get milk. Basic nutrition information included.

MILK FROM COW TO YOU - $8.00

Grade Level: Teacher Reference

Format:
Extra Large Color Poster (same available as small handout for .20 ea.)
Description:
Pictorially tells the story of the production of milk through processing and distribution to the consumer's table.

NOTE: **These are available from regional Dairy and and Nutrition Council Offices**

Ohio Department of Agriculture
607 Ohio Departments Building
65 South Front Street
Columbus, Ohio 43266-0308
(614)466-8798

THE A B C's OF AGRICULTURE - FREE

Grade Level: K-2

Format:
Coloring Book, 19 pages
Description:
Large pictures depicting crops and livestock raised in Ohio.

Ohio Apple Marketing Program
Two Nationwide Plaza
Columbus, Ohio 43216
(614)249-2424

ORCHARD DIRECTORY - N.C.

Grade Level Teacher Reference

Format:
Brochure opens to poster size.
Description:
Listing of commercial orchards in Ohio plus "Ohio" map.

APPLE PICTURES - AS SPECIFIED IN DESCRIPTION

Grade Level: Teacher Reference

Format:
Variety of colorful classroom resources.
Description:
Ohio Apple--reversible, die cut, color, 10" x 14" ($2.50); Apple Products Banner--12" x 36" ($.75); Apple A Day--variety chart ($1.25)

PRODUCED WITH PRIDE - $.08

Grade Level: Jr. Hi & Up

Format:
Brochure
Description:
Discusses food safety, nutritional value, and regulation of fruit and vegetable industry.

APPLE ACTIVITIES PACKAGE - $3.00

Grade Level: K-2

Format:
A teaching kit including black-line masters.
Description:
Activities teach health and nutrition facts, science principles and math. Information presented will prepare students for a field trip to an orchard.

Ohio Grape Producers
6877 N. High St. #104
Worthington, Ohio 43085
(800)684-8463

OHIO WINE COUNTRY - FREE

Grade Level: Teacher Reference

Format:
Brochure, 1988
Description:
Map of locations of wineries in Ohio including addresses, phone numbers and whether tours can be arranged.

Ohio Beef Council
P.O. Box 845
Westerville, Ohio 43081
(614)898-7771

FOOD POWER TOWER - $2.00

Grade Level: K-1

Format:
Teacher's packet includes teacher's guide, 16 black-line masters, bulletin board directions, and the story, "Mystery at the Food Power Tower".
Description:
Nutrition education program to help children identify where food comes from and explain why they need to eat a variety of foodS.

BEEF BUILDS BETTER BODIES - FREE

Grade Level: 2-5

Format:
Booklet of activities and recipes.
Description:
Information on beef nutrition, production and preparation, including four recipes designed for children.

BEEF WALL CHART - $1.00

Grade Level: All

Format:
24" x 36" color poster
Description:
Chart shows wholesale and retail cuts of beef. Correct cookery methods for each cut are given.

COMING TO AMERICA - $4.95

Grade Level: 4-5

Format:
Teaching Kit including 6 color study prints teacher's guide, 12 black line masters, and reference sheet. (1989)
Description:
A multi-disciplined education program designed to be used as a supplement to story of the pilgrim voyage and early colonization.

NUTRITION, FOOD & CULTURE - $6.95

Grade Level: 4-7

Format:
10 study prints with lesson plans, 9 black-line reference sheets, 4 black-line activity sheets, teacher's guide, glossary.
Description:
The ten study prints examine the food habits, traditions, and agricultural practices of eight cultures.

PARTNERS IN PRODUCTION - $1.00

Grade Level: 4-8

Format:
Full-color, 24" x 36" poster and teacher's guide.
Description:
Color photographs of people involved in food production. Accompanying guide features a career cluster activity.

POWER PACKED NUTRITION - $12.95

Grade Level: 6-8

Format:
Apple II Double-sided program disk, teacher's guide, 3 black-line masters, full-color poster.
Description:
Complete educational program to help students see the relationship between calories and nutrients in the food they eat. Software includes tutorial, database of common foods, and a nutrient density game.

SHAPING A NATION - $16.95

Grade Level: 5-8

Format:
An educational kit including video tape, activity masters, teacher's guide and poster.
Description:
Video begins with the role of livestock in U.S. history and then leads into a discussion of the four factors of production, the market system, and specialization. Activity sheets expand on the basic economic concepts.

VEAL WALL CHART - $1.00

Grade Level: All

Format:
24" x 36" color poster
Description:
Chart shows wholesale and retail costs of veal. correct cookery methods for each cut are given.

Ohio Egg Marketing Program
674 W. Lane Avenue
Columbus, Ohio 43210
(614)292-2089

EGGS BASIC KIT - $10.00

Grade Level: 6-12

Format:
Educational video kit including video tape, classroom activity suggestions, and recipes, 1988.
Description:
Kit teaches about eggs and their relationship to good nutrition. Focus includes production, grading, sizing, storage, and cooking knowledge.

Ohio Farm Bureau
P. O. Box 479
2 Nationwide Plaza
Columbus, Ohio 43216
(614)249-2473

FARMING FOR OUR FUTURE - $.30

Grade Level: 4-6

Format:
14 page comic book (1987)
Description:
A flying saucer gives a bird's eye view of agriculture--detailing the importance of the industry to our country's economy and the many skills a farmer uses to be successful at the business of farming.

MY FAMILY'S FARM - FREE LOAN

Grade Level: 2-5

Format:
Video, 12 minutes
Description:
Explains what happens on a midwestern farm. Includes grain farming, livestock production, poultry and egg production, and dairying.

THE CHOICE IS YOURS - $15.00

Grade Level: 7-9

Format:
Computer disk for Apple II, teacher's guide, reproducible student activities, wall chart and evaluation form in 3-ring binder.
Description:
A career education curriculum which explores over 250 career opportunities. Personality type inventory included.

THE OHIO FARM - $.10

Grade Level: K-3

Format:
Coloring Book - 24 pages
Description:
Basic information about what's grown on Ohio farms and what consumers get from farmers. Full page map of Ohio with counties outlined and named.

The Ohio Holstein Association
1375 Heyl Rd., Box 459
Wooster, Ohio 44691
(216)264-9088

PICTURES, POSTERS OF HOLSTEIN DAIRY COWS - $2.50

Grade Level: K-12

Format:
Small size prints of Holstein cows suitable for reports and available in quantity. Large poster available for purchase, suitable for bulletin board use. Colorful addition to information about agriculture, food production and the international origin of livestock.
Description:
Also, able to fill individual requests for information and pictures about the most popular breed of dairy cows in the U.S.

Ohio Veterinary Medical Association
1350 West Fifth Ave., Room 30
Columbus, Ohio 43212
(614)486-7253

ANIMALS...THE HUMAN CONNECTION - $15.00 OUTSIDE OHIO; $5.00 IN OHIO

Grade Level: 4th

Format:
A teaching kit including teacher's guide, 19 black-line masters. Informational sheets about ticks and fleas, recommended reading list, letters to parents, veterinarian (inviting him/her to speak) and a full color poster.
Description:
Multi-disciplined program specifically designed for the 4th grade. Includes daily teacher's guides for five - 45 minute periods which focus on selection and care of pets, and the responsibilities of pet ownership without promoting or encouraging student to ask parents for a pet. Topics covered are: the human-animal bond, pet loss, euthanasia, neuter/spaying, training, animal disease, role of veterinarian.

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Ohio Pork Producers Council
135 Allview Road
Westerville, Ohio 43081
(614)882-5887

***FOCUS ON PORK - $.25**

Grade Level: Jr. High-High School

Format:
16 page full color booklet.

Description:
Designed primarily for home economic students. Covers buying, storing, preparing, and serving pork, with updated nutrition and cookery tips.

***PORK VIDEO - CALL OPPC TO INQUIRE**

Grade Level: Jr. High to High School

Format:
15 minute video; may accompany Focus on Pork or stand alone.

Description:
Covers nutrition, cookery, selection and storage of pork products.

***RETAIL CUTS OF PORK WALL CHART - $1.00**

Grade Level: --

Format:
Color chart 24" x 36"

Description:
Same as notebook sized chart.

***HEALTH & NUTRITION: A MATTER OF FACTS - $2.95**

Grade Level: 7-12

Format:
An educational kit including teacher's guide, 13 black-line masters and U.S./R.D.A. chart also problem-solving study sheets.

Description:
Supplemental resource for health/physical education classes. Focuses on nutrition and exercise information. Helps students distinguish between health and nutrition fact and fallacy.

***HISTORY MATTERS: A STORY OF CHANGE $12.95**

Grade Level: High School

Format:
An educational video kit including teacher's guide, 4 black-line masters, and 1/2" VHS video tape.

Description:
Students learn that history can be used as a tool to make present day decisions and see the livestock industry as one which has changed to meet the demands of today's consumer.

PORK FACTS - $.75

Grade Level: Teacher Reference

Format:
20-page booklet utilizing tables, graphs, text, and illustrations to summarize today's pork industry.

Description:
An overview of the pork industry including: history of the pig, production, glossary of production terms, industry statistics (size of operations, pork consumption, import/export, etc.)

***RETAIL CUTS OF PORK NOTEBOOK SIZE CHART - $.05**

Grade Level: --

Format:
Color chart 8" x 11"

Description:
Shows wholesale and retail cuts of pork and what part of the animal they come from. Each cut is named and correct cookery methods are listed for each.

*May be ordered directly from Meat Board

REPRODUCIBLE FACT & TRIVIA SHEETS - N/C

Grade Level: Junior High thru Teacher Reference

Format:
A set of 7 fact sheets which may be used as teacher resource or reproduced for students.

Description:
Fact sheets cover history of the pig; glossary of production terms and major breeds; 8 major breeds pictured; Ohio pork trivia; general pork trivia; pork by-products and medical contributions; farm income.

***THE CASE OF THE PURLOINED PORK - $8.00 BOOK ONLY; $15.00 BOOK & TEACHER'S KIT**

Grade Level: 2nd

Format:
32 page hardbound storybook; full color. The kit includes the storybook, 10-page teacher's guide, 11 black-line masters, and three wall posters.

Description:
Story about 2 detectives who solve the riddle of Grandma Bunches' missing holiday ham. Introduce children to urban/rural interdependence. Kit includes social studies unit on interdependence.

THE NEW PORK: DELIGHTFULLY DIFFERENT - N/C

Grade Level: 9-12 and above

Format:
Includes teachers guide; 4 reproducible activity sheets; full color wall chart of pork dishes; 8" x 11" retail cuts of pork chart.
Description:
Designed for home economics students; examines healthy diet choices and updated pork cookery.

WILBUR--A SPECIAL FRIEND - $1.00

Grade Level: K-3

Format:
8 page coloring book
Description:
Wilbur introduces students to his life on the farm, Farmer Brown, and pork products and by-products.

Ohio Soybean Association
P.O. Box 479
Columbus, Ohio 43216
(614)249-2422

SOY OIL - FREE

Grade Level: Teacher Reference

Format:
Recipe Booklet
Description:
9 recipes using soy oil

FACTS ABOUT FATS IN YOUR DIET - FREE

Grade Level: Teacher Reference

Format:
Brochure
Description:
Includes information on saturated, hydrogenated and polyunsaturated fats; chart comparing most common vegetable oils; and discussion of fats in most diets.

Potash & Phosphate Institute
Suite 401, 2801 Buford Hwy., NE
Atlanta, Georgia 30329-2137
(404)634-4274

NITROGEN: THE SUPERSTAR - $1.00

Grade Level: Jr. High & Up

Format:
10 Pages, color educational pamphlet.
Description:
Discusses nitrogen's importance to the growth and reproduction of all crop plants.

PHOSPHORUS: THE ENERGIZER - $1.00

Grade Level: Jr. High & Up

Format:
10 pp, color, educational pamphlet
Description:
Successful food production depends on the plant nutrient phosphorus. Pamphlet describes the vital role of and in the production of food and fiber.

POTASSIUM: THE REGULATOR

Grade Level: Jr. High & Up

Format:
10 pp., color educational pamphlet
Description:
Explains how potassium is essential for all plant, animal and human life.

MICRONUTRIENTS: THE ACTIVATORS

Grade Level: Jr. High & Up

Format:
10 pp., color educational pamphlet
Description:
Explains the signficant contributions which micronutrients make to crop plants.

National Junior Horticulture Association
5759 Sandalwood NE
North Canton, Ohio 44721
(216)492-3252

NATIONAL JUNIOR HORTICULTURAL ASSOCIATION'S YOUNG AMERICA HORTICULTURE CONTESTS

Grade Level: 2-9

Format:
Send for details in specific contest area and for application, due by October 15th.
Description:
Four contests for individuals or groups - Gardening, Plant Propagation, Environmental Beautification, Experimental Horticulture.

A Soil Ecosystem Transparency

Background Information

The soil beneath our feet is full of life. Many animals, such as moles, badgers, and prairie dogs use the soil to find food and shelter. Earthworms and many insects also live in the soil. As these animals burrow and tunnel, they mix the soil, allowing air and water to penetrate beneath the ground's surface. Plant roots stretch down through the soil where they can absorb the air, water, and nutrients needed for growth.

In addition to these plants and animals, billions of microscopic organisms, such as bacteria and algae, inhabit the soil. They, along with fungi, earthworms, and other soil creatures play an important role in the decomposition of organic material. Decomposers help break down dead plant and animal tissue. Nutrients are returned to the soil, where they become available once again to plants.

The next time you stand on the soil, think about the billions of organisms at work beneath you. They are part of a cycle that returns valuable nutrients to the soil. Without these unseen creatures, the plants we depend on for food could not grow, and the life-sustaining cycle on earth would be broken.

About the Transparency

The transparency illustrates a cross-section of hypothetical soil. The top portion of the circular enlargement is about 50X normal size; the center, about 150X; and the bottom about 300X.

Transparency Use: Write on it with a grease marker. Remove markings with a dry towel. Permanent-ink and water-soluble transparency marker writing cannot be removed without damage to the emulsion.

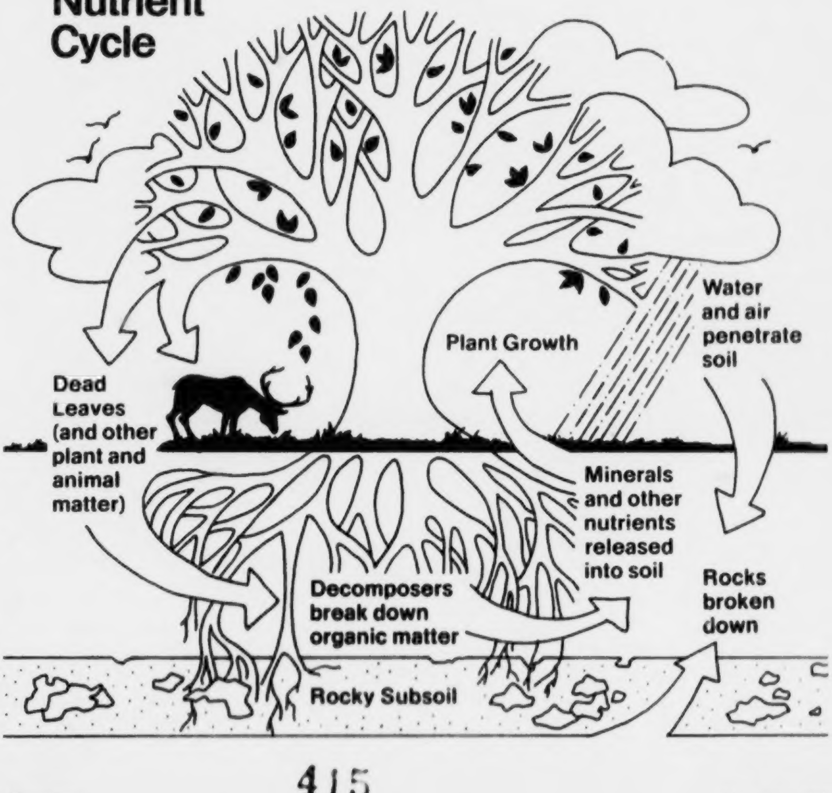
Activities

★ Use the transparency to introduce the topic of soil.
- What evidence of plant life do you see in this soil profile? (dandelion, grass, leaves, acorn, algae)
- What animals live here? (earthworm, snail, centipede, spider, cricket, daddy-longlegs, shrew, grub, ants, nematode, bacteria)
- What role do these plants and animals play in the ecosystem? How do they use the soil? How do they contribute to the nutrient cycle? Can you see different soil layers? Do some plants extend their roots into the subsoil layer?

★ Collect soil samples from different areas. Working in groups, have your students examine the soil samples using a white tray or sheet of paper, a bright light, forceps, and a magnifier. What different plants and animals can they find? Can they identify them using resources from your library? Find out what role these plants and animals play in the soil ecosystem.

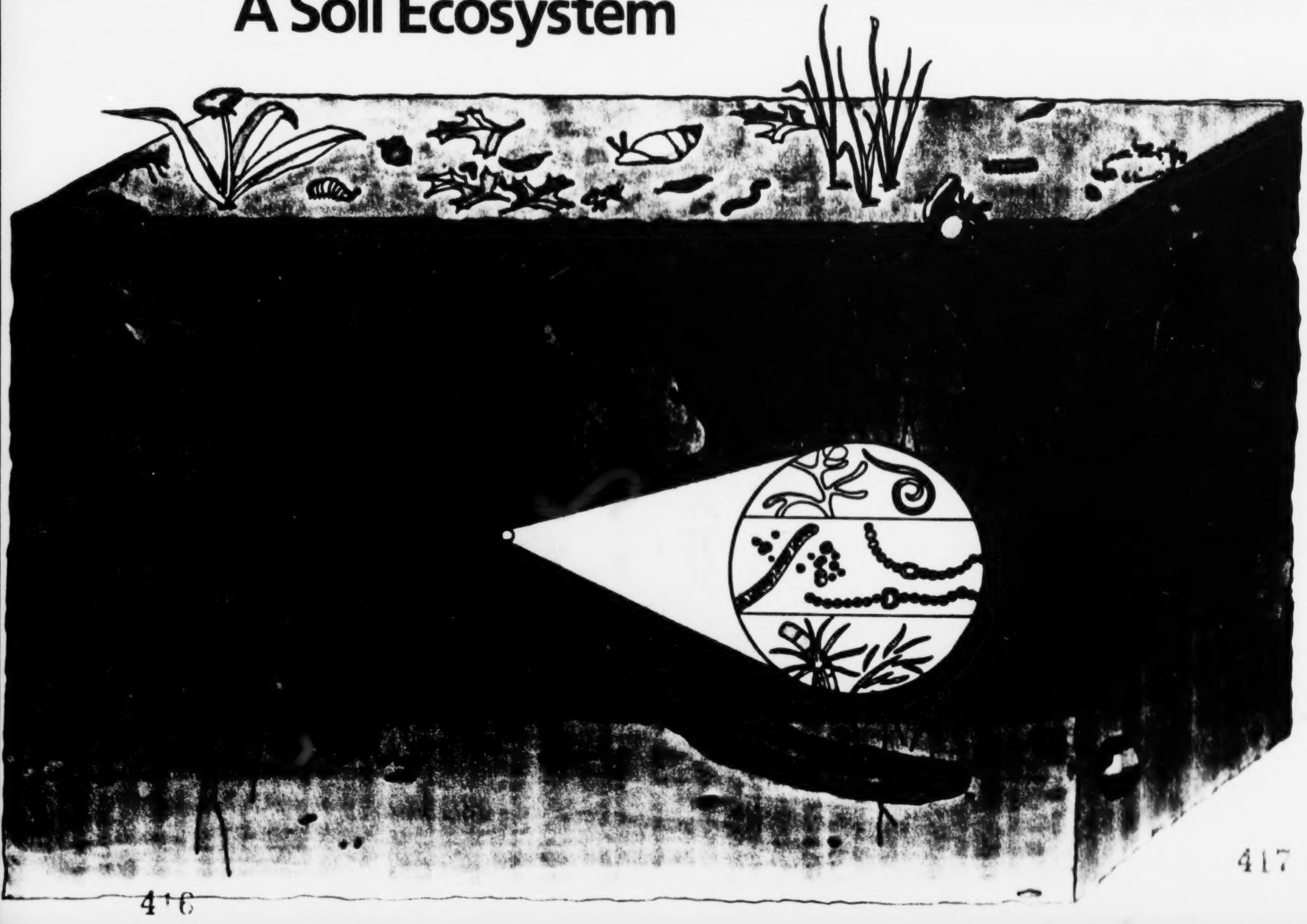
★ Create a soil mural by projecting the transparency onto a large sheet of white paper, using an overhead projector. Trace the image and add other plants and animals that live in the soil.

Nutrient Cycle


Water and air penetrate soil
Plant Growth
Dead Leaves (and other plant and animal matter)
Minerals and other nutrients released into soil
Decomposers break down organic matter
Rocks broken down
Rocky Subsoil

Provided by USDA Soil Conservation Service.

A Soil Ecosystem



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A Soil Profile Transparency

Background Information

A soil profile is a slice of earth several feet deep. It shows layers of soil — some less than an inch thick, some over 2 feet thick.

By studying soil profiles, scientists learn about the soil, its characteristics, and how to use and protect it.

Sand, silt, and clay are the various sized particles that make up soils. The texture of a soil is determined by the relative amounts of these particles in the soil. For example, a sandy clay soil may contain about 50 percent clay, 45 percent sand, and 5 percent silt. Loam soils contain about equal amounts of all three.

Some soils were formed by the breaking down and weathering of rock. Others were formed from materials transported and deposited by water, wind, or glaciers. Deep soil layers and rock change very slowly.

It takes 100 to 600 years, or more, to form an inch of topsoil. Wind and water erosion can remove that much topsoil in a single year. When a soil erodes excessively, the exposed subsoil is more difficult to cultivate and less productive for plant growth.

About the Transparency

Most soil profiles have a surface layer of organic material and two or three layers of mineral materials. These are the horizons of a typical soil profile.

If present as organic material, the 0 horizon at the top is usually less than an inch thick. The dead plant and animal materials decompose into nutrients that enrich the soils.

Topsoil, the A horizon, is the upper soil layer. Plant roots, bacteria, fungi, and small animals are abundant. Plants thrive in it. It has more organic matter and is darker than the subsoil.

Subsoil, the B horizon, is the middle soil layer. It has fewer organisms and less topsoil. Plants don't grow as well in it. If subsoils are clayey, they usually are harder when dry and stickier when wet than the surrounding soil layers.

The C horizon is the lowest layer. It is less altered and weathered than the layers above and has less living matter. It may be called the parent material. It gets this name because it is the weathered rock and partly weathered soil from which the soil layers above were formed.

Transparency Use: Write on it with a grease marker. Remove markings with a dry towel. Permanent-ink and water-soluble transparency marker writing cannot be removed without damage to the emulsion.

Activities

★Use the transparency to introduce the topic of a soil profile.

...What differences are there in the horizons? (depth, color, plant growth, soil particle or rock size)

...Why is the particle size important to plant growth and the water-holding capacity of soil? (more total surface area on small particles, better aeration/water flow through mixed soil sizes)

...What results if plant cover is absent? (soil erosion/lost fertility)

★Locate different soil profiles in streambanks, roadside cuts, and building-site excavations. Have students point out color, texture, and appearance changes in the horizon, measure horizon depths, sketch the profiles studied.

★Fill a fruit jar 2/3 full of water, add soil to nearly fill it; shake vigorously. Let soil fully settle. Have students hold paper beside the jar, draw the different layers, and label each as clay, silt, sand, or rocks.

★Collect samples of sand, silt, and clay from various sites. Have students examine and describe each sample. Identify soil textures (most examples will be mixtures).

★Show how soil is created.

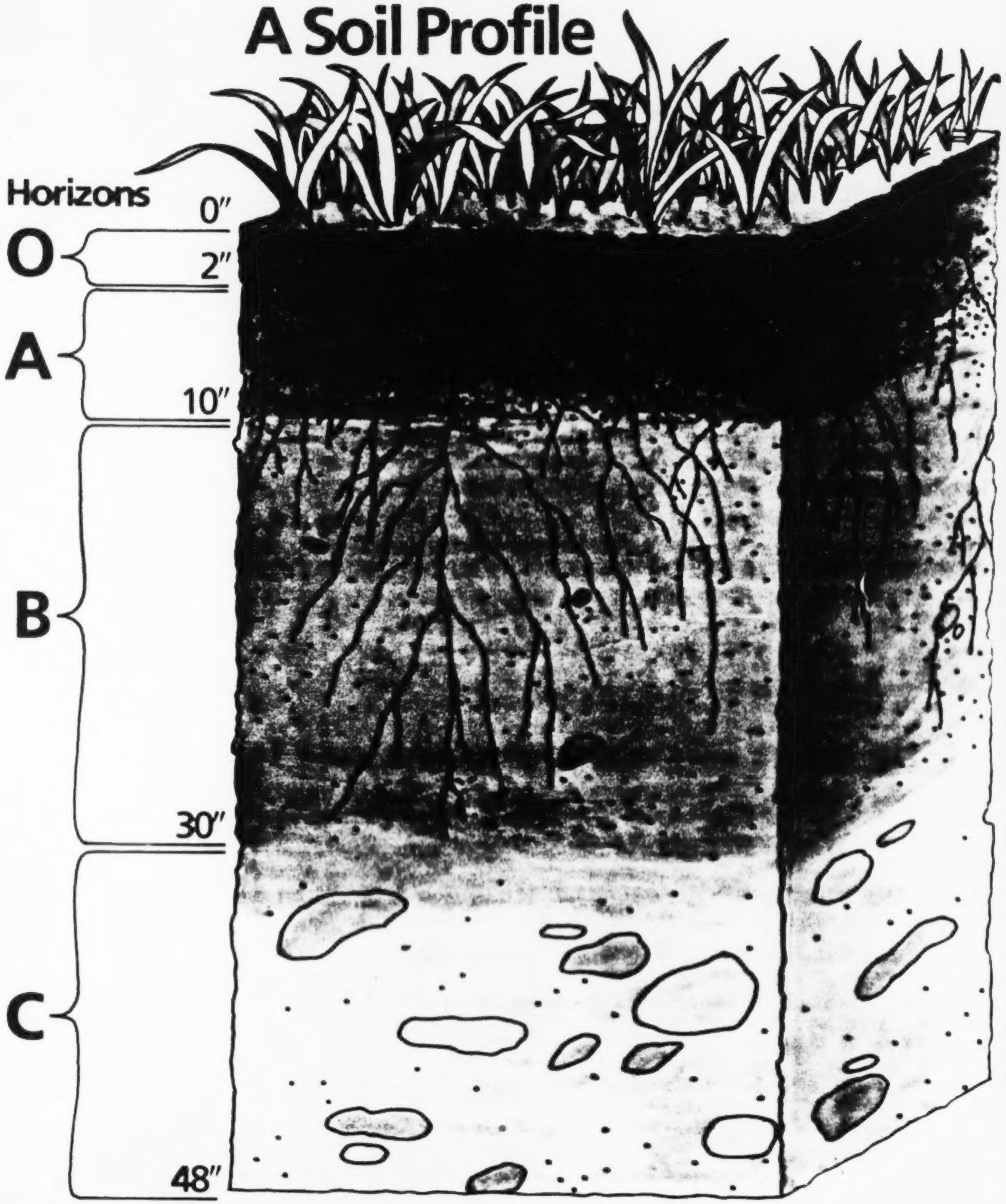
...By abrasion: Rub together limestone, sandstone, brick, or concrete.

...By heating: Fully heat limestone and drop it in ice water; it should crack or break.

...By freezing: Freeze water in a glass jar; what happens to the jar? Water trapped in rock freezes and rocks break into smaller and smaller pieces.

Provided by USDA Soil Conservation Service

March 1989


A Soil Profile
Horizons
O
A
B
C
0″
2″
10″
30″
48″

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